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APRIL, 1939

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AVIATION

The Oldest American Aeronautical Magazine



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AVIATION

Products

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THIS is important news to everyone interested in aviation—in private flying, sailing and instructing. The CofA advertisement reproduced above in actual size appears in *The Saturday Evening Post* April 6 and another the same size May 6. Also half-

pages in *Popular Science* in April and June and third pages in *Outdoor Life* in April and May. This advertising by Cub in such national publications as the Post, with more than 3,000,000 copies per issue, should do much toward the securing of private furs.

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ON YOUR NEW SHIP SPECIFY GOODYEAR AIRPLANE TIRES AND BRAKES

AVIATION

April 1937

4

THE PROBLEM:

to make This; and This; and This;



add up!

To you the ways of putting metal parts together so they make an airplane may seem pretty much alike, and a job to be left to the expert. But it's also a matter of strength-weight rules, which mechanical structural problems affect load capacity, cost, and safety, all vitally important to everyone interested in aeronautics.



That is why the men responsible for the performance of Alcoa Aluminum Alloys are deeply concerned with research on structures. To suit Aluminon to the job it must do, they follow a program of studying experimental structures of Aluminon. The three structural frames shown in the headline are part of such a study, in which twelve were built and tested to destruction, to

find out how closely the engineers' computed predictions would check with actual performance of the frames under load.

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AVIATION

April 1937

5

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133 E. STREET, Operations Manager
Mid Eastern Airlines, Inc.



B H STELLAMAN Dept of Medicine (see
M10-C, column 2) *Harvard, Inc.*



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—A new minimum wage is being set at 10 cents an hour, and a new minimum wage is being set at 10 cents an hour.



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Linda Trelling from
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東京大学 経済学部
2010

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April, 2019



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YOU CAN SAVE UP TO 50% AND MORE IN ASSEMBLY COST!

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IT COSTS LESS TO USE PHILLIPS SCREWS

AVIATION
April 1933
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AVIATION

THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

Established 1877

APRIL 1933

REGULAR EDITION

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FRANCE CHOOSES LOCKHEEDS

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**LOCKHEED**

Picked Up Along Editorial Airways



LOOK TO LOCKHEED FOR LEADERSHIP

■ THE C.A.A. CAN SLEEP easily tonight, now that the Senate has confirmed all the appointments originally made by the President. Not that we had expected anything different, but there had been persistent rumors of possible splits—and you never can tell what a bunch of senators may do when they sit down and put their heads together. There, at least, is one more bit of red tape out of the way.

TO THE ALLIANCE APPOINTMENT
 to the Number Three spot on the
 Safety Board came as a bit of a
 surprise, but it was a number of
 things working against that have been
 going on for some time. I was
 probably more or less in the end. And
 everyone who reads *Amateur* knows
 we have had our own ideas about the
 industry and the functions of the C.A.A.
 and the Safety Board. One can check
 out the *Amateur* for the last few
 years, say on p. 19 of the August
 1978 issue. We know C.R. well
 enough, however, to be sure that he
 will mesh as well with the work which the
 Safety Board has already done and
 which he will be doing. I think that
 he has already been asked for his
 independent expression and as a news-
 paper man of long standing has the
 ability to get at the bottom of obse-
 curities—to both of which should be
 added that the work he is now
 undertaking in the *Amateur* is new
 and for his of the *Amateur*, our

In This Issue

[illegible]

bership, but does not clear up the mystery as to why the final Safety Board appointment was so long delayed.

★ **FOR AMUSING READING**
There is nothing better than the record of a struggle on Congress. Any subject there almost any Congressional session. —where a lot of people around Elmer began to debate about with some of the technical aspects of their human progress because, almost everything can happen. We offer, for example, the following interchange between one of the Author's members and several distinguished members placed from pages 198 and 339 of the hearings before the Committee on Military Affairs of the U.S. Senate on HR 3396.

Serena Hild: Will you please tell us what a helcomer is?

Mr. Mason: It goes straight up and straight down without injury to anybody.

SENATOR HILL: You mean the
what do you?

SENATOR HALL. What we know at the moment?

Mr. HANSEN: No, the autogire relies on forward motion to continue to support, similar in a sense to an airplane.

SEYMOUR HALL: In other words, you would have to go forward while you get more us?

1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 26

AVIATION
April 1966
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No doubt you, at the school, throughout the entire period of study, are in a position to receive the most advanced training in the field of aviation. The school is open to youth of all creeds and denominations. The school is open to youth of all creeds and denominations. The school is open to youth of all creeds and denominations.



Booked 25 miles from Chicago's Loop

If you are looking for a high level of education in your field, you should consider the Lewis Holy Name School of Aeronautics. This school is open to youth of all creeds and denominations. The school is open to youth of all creeds and denominations. The school is open to youth of all creeds and denominations.



In addition, the program includes modern law, administration, engineering, aviation, and other subjects in all of these phases connected with the aviation industry. In fact, no subject is neglected in this school. The school is open to youth of all creeds and denominations. The school is open to youth of all creeds and denominations. The school is open to youth of all creeds and denominations.

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LEWIS HOLY NAME SCHOOL OF AERONAUTICS
LOCKPORT, ILLINOIS

There are no divided sections.

Name _____

Address _____

City _____ State _____

AVIATION
April 1938
14

Mr. Mason: Yes, sir, it is a gas gyro. But the helicopter will go straight up or stand steadily in one place . . .

SEANIN HILL: We have nothing like that at all?

Mr. Mason: No sir.

SEANIN HILL: How do you spell that?

Mr. Mason: Helicopter.

SEANIN HILL: Will the Germans be putting these helicopters on the planes they sold us in the French last time they put them on for themselves?

Mr. Mason: The helicopter is a type of kite.

SEANIN HILL: You do not think they would sell them to the French before they equipped themselves with them?

Mr. Mason: They did not mention helicopters.

SEANIN HILL: Is the mechanism much different from an airplane?

Mr. Mason: It is entirely different . . . (He sits—she sits again.)

THE NAVY WONDERED when a recent decision passed over Captain John Towers. But the situation became clear with the announcement of his appointment to succeed Rear Admiral Cade as Chief of the Bureau of Aeronautics come next June. The appointment, of course, comes with it promotion to the rank of Rear Admiral. Jack Towers' experience covers the whole period of aviation in our Navy. Few officers could be more competent to head up the work of the bureau during the critical period of activity and expansion that lay in the immediate future. The President has done well to place such an officer in charge at this time.

IT'S THE LITTLE THINGS that upset him and shake the nerve of lesser men. In our own case it was a wondering germ or two that did the damage and resulted in none of our boys do anything for about three weeks (one of whom was, alas, a very good cop). It was a very good cop, a kind of mischief that is quite easy to catch. What meant that the rest of the staff had to do a lot of extra working about to cover the needs of a busy month. Paul Weston and Brian Stalinski, probably most likely for no or at least important Washington events at the National Aviation Forum and the showing of the Yankee Clipper by the First Lady.



CHIEF SECRETARY was to meet a guest to fly in the Yankee Clipper when she was in New York. She had spent some time aboard her, both on the water and on the air, and reports that she is everything she was supposed to be, and that none but her is a pretty good judge.

LES NEVILLE TRAVELLED (among other places) to Lock Haven to take part in the Light Phone Distributors Meeting held there under Cade auspices. He reported that the sleepy town of Lock Haven looked almost as though a National Air Race had hit it. The hotels were booked not only with distributors, but with agents and accessory manufacturers, finance and insurance company representatives, and others. Large scale entertaining was sponsored by Franklin, Lyman, Continental, Leeway, and International. And even in the days when Lock Haven shined as a tourist town the Fulton Hotel guests never before included a very much older, black hair, and (during the course of the speeches were President Dyer's humorous account of the company's history and Publisher Thomas Dyer's lively address to address. Then, reports in the community was the award to Sales Manager St. John of a replica of President's Hall.



"Maybe just heard about the Duxey Battery When Aircraft Hit!"

AVIATION
April 1938
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Comfort Creates Confidence



ALL your careful forethought, all the long hours of training, all your investment in modern equipment comes into play, significant focus when the ship lands and soon down the runway.

These brief moments of ground contact are vital confidence-builders. To the degree that they are comfortable moments, they inspire confidence — your most precious asset.

Bendix Airplane Wheels, Brakes and Pneumatic Shock Struts effectively absorb the impact shocks of landing and cushion the heavier shocks of taxiing and take-off. They are smoothly cushioned, designed in scientifically proper relationship to each plane's weight and balance. They are precision-built, with long experience and your facilities at hand. They are quality-guarded by close metallurgical control and rigid, close-tolerance inspection. They are, thus, the finest landing gear equipment available. That is why they are so universally used.



BENDIX PRODUCTS DIVISION
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AIRPLANE WHEELS • BRAKES • PILOT SEATS • PNEUMATIC SHOCK STRUTS

AVIATION
April 1959
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Side Slips

By
ROBERT OSBORN

IT was a very nice idea to have Mrs. Roosevelt envision the new "Tudor Clippers" before it is placed in the trans-Atlantic service, but we do think that Pan American could have avoided flying the ship to Washington specially for the ceremony. The flying boat had stopped at San Diego, Galveston and New Orleans on its trip from Seattle to Baltimore, and if it had stopped in any of these places only a day or two Mrs. Roosevelt would certainly have met up with it in the course of her regular tour of the country.

WASHINGTON, Kalamazoo, just returned from three months of Antarctic expedition, announced in Sydney, Australia, his plan for another expedition to the same region. He intends to fly from the Bay of Whales in the South Pole and spend the entire winter there with two companions. Mr. Kalamazoo could realize a very handsome profit on this plan of the large demonstration of the world were



allowed to select his two companions, and could be accused that the persons they selected would go along.

"JURY LOCKED UP IN AIRPLANE CASE"—N. Y. Times headline issued by Mr. R. A. S.

Knew though the "all purpose air-

plane" of before you was never very much of a success, it seems that there might be some possibility of an "all purpose airplane case" now that they are being used for jury boxes, as well as for chicken houses, AAAs, garages, bath houses, roller rinks and landings.

A STORY THAT says that because of the spell of bad weather throughout the country recently, an entire passenger trying to fly from Nashville to Knoxville was taken on to Washington. Then he was routed through Pittsburgh, Columbus and Louisville back to Nashville again, as Knoxville was still closed in. From there he went on by train to his destination and, handsomely satisfied, having traveled six times the distance he originally intended.

The Intrepid Aviator was in the office to register a complaint about the changes based on reports we are now receiving, and in the course of his conversation commented on this action. He said that he personally would be the first to appreciate the conversation on the part of the airline but thought we ought to be on guard against some man crack from the raincoat about the "Grandfather Clause" in connection with this particular news item.

AT THE National Aviation Forum in Washington, Mayor La Guardia stated that he will not be installed with New York's station of its airport problem even with the opening of the \$20,000,000 South Beach Airport. He said he had his eye on "another piece of property within New York City for an airport to take

care of traffic that is bound to come in the future.

Mayor La Guardia has been famous all through his career for the handling of problems and one he is running into is that with airports already in the city they are in need. Could we learn from the location of the "new place of property" however, we shall continue to suspect that the richest and healthiest commercial location of municipal airport property being either many feet or arm's length away from well built roads.

MRS. ROOSEVELT'S comment—All I know is what I read in the papers' one says he paraded to "All I did can be read on the wings" if the seasonal stamp comes in the price cost of aviation matter. On March 26th Newsmagazine commented Mrs. Wright in and all of the flying boats. The Newsmagazine I read along about his plane flying to the airport, the 2 week stamp about



him stepping out of the plane, the 3 cent stamp passed him at the Pan-American office, the 4 cent stamp passed him reception by the U. S. Airways and the 5 cent stamp on this stamp over the raised city—which is not Mrs. of not doing things by Kalam.

MRS. ROOSEVELT especially was the most enthusiastic of air travelers and his writings on that subject, as well as his example, helped the struggling air lines more than can be readily appreciated. We are now able, on ships and all, but our best recollection of him was at Roosevelt Field, Southampton, we think it was Clarence Chamberlain, took him for a ride in a Bellanca monoplane. As the ship moved up to the line in front of the large crowd that had collected, Mrs. Wright had her out of the side window and called to Custer Jones, "I was flying her, Custer! I was flying her—ok except that had gotten."

A SECRET news item stated that Robert Wright, the former great of Alton, Ill. had given to a flight of 8 foot 44 inches on his twenty-first birthday. We are wondering if it would be wise for Mr. Wright to begin wearing a red light on his hat.

AVIATION
April 1959
27



The Navy too has an ambitious expansion program: New planes for several more carriers. Many more big patrol bombers. Over a dozen new bases. Above a new scout observation plane built in the Naval Aircraft Factory shows its rough water prowess.



The Navy shows Congress what it would buy

W. H. H. H.

Measures for Defense

Our "Air Defense Program" is no simple thing covered by one or two simple pieces of legislation. Important bits of it are scattered through half a dozen pending Congressional measures. Here is how it has shaped up to date.

By

Daniel Sayre and Elaine Stubblefield

Assistant Editor, AVIATION

Washington Bureau, AVIATION

ON JAN. 12th President Roosevelt wrote to Congress: "Careful examination of the most imperative present (defense) needs leads me to recommend the appropriation at this session of the Congress with as great speed as possible, of approximately \$525,000,000, of which sum approximately \$215,000,000 would be actually spent from the Treasury before the end of the fiscal year ending June 30, 1940."

"The survey indicates that of this sum approximately \$155,000,000 should be allocated for new needs of the Army; \$65,000,000 for new needs of the Navy; and \$95,000,000 for training of regular air pilots.

"It is proposed that \$300,000,000 be appropriated for the purchase of several types of airplanes for the Army. This should provide a maximum increase of 3,000 planes, but it is hoped that orders placed on such a large scale will materially reduce the unit cost and thereby provide many more planes."

"I suggest that \$10,000,000 of the \$300,000,000 for airplanes be made immediately available in order to correct the present lag in aircraft production due to late plans."

"I suggest an appropriation of \$10,000,000 to provide 'special lines' of equipment such as anti-aircraft artillery, anti-aircraft rifles, anti-aircraft guns, tanks, light and heavy

artillery, communication and gas masks. "I suggest approximately \$325,000,000 for personnel training for the Army."

"The estimated appropriation of \$62,000,000 for the Navy should be divided into (a) \$40,000,000 for the creation or strengthening of Navy bases in both oceans in general agreement with the report of the Special Board which has already been submitted to the Congress, (b) about \$20,000,000 for additional Navy airplanes and air material tests."

"Finally, national defense calls for the annual training of additional air pilots. This training should be primarily devoted to the essential qualifications for civilian flying. In co-operation with educational institutions, it is believed that the expenditure of \$10,000,000 a year will give primary training to approximately 20,000 citizens."

"Devoted to all systems, this program is but the nucleus of requirements."

Within the limitations of its role,

Congress pitched in. For over two months and a half now, it has devoted a large part of its time and energies to the proposed program. With the sole important exception of proposed harbor improvement at Guam, all Congressional votes during that period have indicated that Congress will cheerfully pay every item requested by the President.

Meanwhile, Aviation studies must understand that this "program" is not something that first up with ribbon and set out in one or two pieces of legislation. Important parts of it are scattered here and there through at least a half dozen different measures. Many of its details are not matters requiring legislation at all, but will be ordered simply by administrative order.

Broadly, the various parts of the program can be broken down into: (1) authorization for increased plane strength; (2) appropriations for such expense; (3) plans and methods for effecting it; (4) maintenance, improvement and methods of training for the required increase of personnel; (5) information and appropriations for new bases. That the Army and Navy should be considered separately is, of course, obvious.

Planes for the Air Corps

Perhaps the most spectacular single piece of legislation in the entire affair is the bill, known as H.R. 3791, to

authorize the issuance of the Air Corps plane strength. As we go to press, slightly different versions have been passed by the House and the Senate by overwhelming majority votes in both cases. A conference committee of the two houses has not yet finished touching on a compromise version which is almost certain to meet quick approval from both chambers.

The most important provision in it specifies that the Secretary of War is hereby authorized to equip and maintain the Air Corps with not to exceed six thousand serviceable airplanes. . . . In order to maintain the number specified above the Secretary of War is hereby authorized to replace obsolete or unserviceable aircraft from time to time . . . and provided further that the total number of airplanes authorized in this section shall include the number necessary for . . . the National Guard and . . . the Government Reserve.

As will be described later, this act also goes into considerable detail in providing for an adequate increase in both the commissioned and enlisted strength of the Corps. It also carries authority for the "educational orders" for various military supplies as requested by the President.

Of utmost importance to the Aircraft Industry are these unannounced provisions: That contractors for aircraft under this act shall be bound to 12 per cent profit (but not

they shall be allowed to deduct any losses suffered in Army contract work over a four year period in computing such profits). That the War Department is authorized to purchase aircraft, and to lease and lease-purchase planes authorized in any design specification on a basis of 75 per cent, 50 per cent and 50 per cent respectively of the price bid for the class of such type. It does not necessarily have to do so however. There are no special labor requirements included beyond those attached to any governmental contract.

It must be understood that H.R. 3791 is solely an act of authorization which was necessary to permit the Air Corp to exceed the latest goal of 2,300 previously set for it on the recommendation of the Baker Board. Like every similar congressional act, it means only as much as Congress chooses to make it mean through re-approval of funds.

Money for the planes

In this case it seems apparent that Congress has every intention of following through with the money. The \$50,000,000 asked by the President to carry the plane program has been placed in the Second Deficiency Appropriation Bill which is expected to pass vote during the early days of April. Other parts of the total of \$50,000,000 authorized by F.D.R. as the cost of the air corp increase will



Typical of the brilliant new plane types authorized in the Army's choice is this ultra-modern biplane leader by Martin.



Left: Typical of some Air Corps facilities in this new Expansion Supply Depot.

surely also included. So let this 1940 bill have passed only by the House Senate approval without important change one however be expected again.

The exact plans which the air corp has prepared for its pronounced program under the enlarged authority have, of course, not yet been announced. For \$50,000,000, it expects to get at least 3,000 planes, and it expects to receive deliveries on them "within 18 months in two parts." With the exception perhaps of training planes, it intends to let contracts only for ultra-modern types. It feels it has such models available in all size one or two airplanes for which competitors have been ordered within the near future.

According to Assistant Secretary of War, Louis A. Johnson, the Corps has already decided on the basis of recent observation, as just what numbers and to what kind of contractors it wants to award the great bulk of its orders. And it will place these contracts, within a very short time of its receipt of news that Congress has appropriated that total \$50,000,000.

Other fragments of news to the industry. Any idea which the Administration might have had last year of establishing intended factory units of any kind are now completely shelved.

Reports that the Air Corps would bring great pressure upon airplane factories now located in coastal regions, to move "away from the mountain regions" can be put away and forgotten—the War Department would naturally like to have any factory plants "inland" reliability in building aircraft is obviously a vice, but

(There is page 71)



Asst. Sec'y Louis A. Johnson



2nd. Gen. Henry H. Arnold



Asst. Sec'y Charles Edison



Sen. Adm'l Arthur C. Cook

On the shoulders of these four men has rested the burden of airplane complex program for increasing our air defenses—and

of solving these programs in Congress



GROOMING

Canada's Aircraft Industry

Total orders on the books, with prospects of substantial quantities to come, are lifting Canadian aviation from the doldrums.

THE CANADIAN AIRCRAFT INDUSTRY is being groomed to become once again an important source of supply for Great Britain in case of a far eastern war. Once before the war, Canada relied on Canada to supply the needs of war. During the World War, Canada assembled surplus manufacturing plants in Toronto produced 2,800 two place fighters for European war zones. This surplus gradually went on to the 36 Canadian aircraft manufacturing companies will be starting production of military aircraft for the British Air Ministry, and the Royal Canadian Air Force.

In the summer of 1938 a British Air Mission toured Canada and conferred with aircraft manufacturers and the Canadian government. As a result several orders have been placed with individual companies and with a specially formed syndicate for the production of fighting air planes in succession have specified the Canadian aircraft industry can build military machines. If production this year and next comes up to expectations, orders for more advanced air planes are expected.

This spring over 100,000 sq ft aircraft assembly plants were erected

**By
James Montagnes**

at Toronto and at Montreal. Each is about the same as the recently completed plant of the National Steel Co. Corporation at Toronto's Midway air port covering 60,000 sq ft in the main building and 10,000 sq ft in the adjoining shops plant and garage house. These two new assembly plants are being built for companies that contract with Canadian Associated Aircraft Ltd., Montreal, a general assembly company formed by leading Canadian builders and its member manufacturers to handle the orders of the British Air Ministry. Colonel Lewis C. Old, Toronto, local engineer, has been brought from England to be general manager of the Canadian Associated Aircraft Ltd. He is credited with the successful development of the British aircraft industry has been many years in England as a railroad car builder and aircraft designer.

National order for the general aviation is an estimated number 21 Bentley Page Hampden bombers

because it is against British Air Ministry regulations to talk about the exact number of planes ordered at their value. Although the general estimates would not reveal the size of the order. Official estimates place it at 240 bombers, at a total cost including plant, equipment and organization cost of more than \$10,000,000. Eighty per cent will be required at each of the Montreal and Toronto central assembly plants to put the machines together, according to an official estimate. The six factories which will build parts will employ about 2,800 men.

The central assembly will also allow (1) for parts to be produced for the Toronto assembly plant at Midway airport by the Ottawa Car Manufacturing Co. Ltd., Ottawa; (2) for parts at Canada Ltd., Port Hope, Ont., and by Montreal Steel Car Corporation, Toronto; (3) parts for the Montreal assembly plant at St. Robert airport by Pierhead Aircraft Ltd., Longueville, Que.; (4) Canadian Car & Foundry Co. Ltd., Montreal; (5) Canadian Vickers Ltd., Montreal; (6) engine, engine and components to come from Engines supplied by the British Air Ministry for installation in Canada; (7) the completed engine bombers to be flown across the Atlantic by ship during the last summer of 1940 though this question has not yet been definitely decided.

Previously the central assembly set-up is a private corporation, respectively (7 are in page 48)



Exhibitors will be made this year in the Pierhead plant at Longueville, near Montreal.



Richard M. Freeman
President, Pierhead Aircraft of Canada Ltd.



Paul F. Ross
President, Canadian Associated Aircraft Ltd.

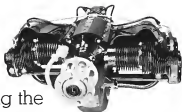


Robert S. Major
President, National Steel Car Corp.

AVIATION
April 1939

Building the

LYCOMING 50



A standard electric fan motor is used in the two halves of the cylinder. After cooling fins have been stamped and painted the two halves are in the mill department. The mill department does the three ground and the porting holes in the two halves by the use of two special fixtures one for each half mounted on an indexing plate.

On the next operation cylinder head castings are set up on a lathe to be turned to the correct size. The lathe is used to turn the head to the correct size. The lathe is used to turn the head to the correct size. The lathe is used to turn the head to the correct size.



The cylinder head castings are then turned on a lathe. The lathe is used to turn the head to the correct size. The lathe is used to turn the head to the correct size. The lathe is used to turn the head to the correct size.

Two workers are shown. A standard machine is used to turn the head to the correct size. The lathe is used to turn the head to the correct size. The lathe is used to turn the head to the correct size.

The next operation is to turn the head to the correct size. The lathe is used to turn the head to the correct size. The lathe is used to turn the head to the correct size. The lathe is used to turn the head to the correct size.



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Exhaust manifold for P & W radial engine. Note before-type expansion joints between each section of the main collector ring and on every cylinder exhaust. Fig. 1



Stacks and Rings

The design and installation of exhaust manifolds and their accessories

Part I—Collector Rings

By George F. Titterton

Executive Engineer, Grumman Aircraft Engineering Corp.

THE pressure and manufacture of exhaust collection, as manifolds, is becoming daily more difficult as engines developing 1800 horsepower and more become available for use. The untold duplication of the best and parts which are by-products of the enormous power is the primary function of an exhaust system. In doing its job the exhaust system must not be permitted to absorb any of the fuel-burned engine power. Furthermore it must be light, rugged, and trouble free. The design of an exhaust system to meet these and numerous other requirements is a job that calls for highly specialized engineering skill and experience.

The following guide must be considered by the designer when developing the exhaust system for a new installation.

The cross-sectional area of the collector must be sufficient to permit rapid discharge of the exhaust gases without creating back pressure. Back pressure in the exhaust system prevents satisfactory scavenging of the burnt gases in the cylinder and results in loss of power. An acceptable exhaust system may have an average back pressure on all cylinders not exceeding 4 inches of water (117 lbs./sq. in.). The back pressure of any one cylinder may exceed that figure providing it is not greater than 9 inches of water (215 lbs./sq. in.). Although the amount of back pressure is primarily a function of the cross-sectional area of the collector it is also affected by the flow path of the exhaust gases. This point will be considered in detail under the sub-heading "Shape and Location".

The cross-sectional area required in any exhaust collector is a function of the power output of the engine. An empirical formula commonly used for computing the cross-sectional area is as follows:

$$A = (.94 \sqrt{P}) / N$$

where:

A = minimum cross-sectional area required at any section

P = maximum horsepower of the engine

N = number of cylinders exhausting into the section under consideration

N = total number of cylinders of the engine.

This formula gives the area required at any point along the collector. The area depends upon the number of

cylinders that have exhausted into the main collector at the section under consideration. In the interest of minimum weight and volume you flow it is advisable to increase the cross-sectional area of the collector as the discharge of each cylinder or pair of cylinders enters the main ring. When the collector is fabricated from sheet material it is customary to increase the cross-sectional area gradually throughout its length. In the above formula the term P/N represents the fractional part of the total horsepower that must be handled by the section being designed. The required cross-sectional area is approximately .94 times this fractional horsepower. When taking a unit is fabricating a collector a stand and run table of sufficient area must be selected for each section of the collector.



Fig. 2. Exhaust manifold for Wright Cyclone R-1525-20 engine. Note cooling water or steam heated exhaust collector ring where this collector is installed. Second air line shown in left is down draft collector of top. Note also the connections for the complex and unusual lines for the turbine exhaust into engine.

An industrial design of exhaust collection is necessary in cross-sectional area as additional cylinders discharge into the main ring. In single-row radial engines of 2, 4, 6, or 8 cylinders the main ring is increased in diameter, and area, between each cylinder. In twin-row engines such as the 14 cylinder type which is now so common it is customary to increase the size of the main ring every 2 cylinders.

TABLE I

Horsepower	Exhaust Volume Capacity	Weight Per Unit	
		Area, Sq. Ft.	Weight, Lbs.
100	100	1.0	100
200	200	2.0	200
300	300	3.0	300
400	400	4.0	400
500	500	5.0	500
600	600	6.0	600
700	700	7.0	700
800	800	8.0	800
900	900	9.0	900
1000	1000	10.0	1000
1100	1100	11.0	1100
1200	1200	12.0	1200
1300	1300	13.0	1300
1400	1400	14.0	1400
1500	1500	15.0	1500
1600	1600	16.0	1600
1700	1700	17.0	1700
1800	1800	18.0	1800
1900	1900	19.0	1900
2000	2000	20.0	2000
2100	2100	21.0	2100
2200	2200	22.0	2200
2300	2300	23.0	2300
2400	2400	24.0	2400
2500	2500	25.0	2500
2600	2600	26.0	2600
2700	2700	27.0	2700
2800	2800	28.0	2800
2900	2900	29.0	2900
3000	3000	30.0	3000
3100	3100	31.0	3100
3200	3200	32.0	3200
3300	3300	33.0	3300
3400	3400	34.0	3400
3500	3500	35.0	3500
3600	3600	36.0	3600
3700	3700	37.0	3700
3800	3800	38.0	3800
3900	3900	39.0	3900
4000	4000	40.0	4000
4100	4100	41.0	4100
4200	4200	42.0	4200
4300	4300	43.0	4300
4400	4400	44.0	4400
4500	4500	45.0	4500
4600	4600	46.0	4600
4700	4700	47.0	4700

This table has many steps in size and joints in the main ring. One important factor for stepping up the size between each cylinder or angle-row section is to obtain a feasible joint that will expand in conformity with the 2 cylinders it joins, at the engine's full hot. In twin-row engines the 2 cylinders fed into a common section of the collector ring are taken 1 from the lower bank and 1 from the upper bank of cylinders. By this means the expansion differential between the 2 cylinders is greatly reduced which makes it practical to join these cylinders in one section of collector ring. No expansion joint is necessary between two cylinders. The area of any section of collector ring joining 2 cylinders must, at all times, be based on the total fractional horsepower of both cylinders, plus the cylinders already fed into the collector.

For purposes of illustrating the computation of exhaust collector area the collection shown in Fig. 1 will be selected. This collector was designed for a 9-cylinder, Wright "C" Cyclone developing 1000 horsepower for take-off.

Each cylinder develops 1000/9 = 111 horsepower.

The required area for the first cylinder is $111 \times .94 = 104.34$ sq. in. for 2 cylinders, $4 \times 104.34 = 417.36$ sq. in. for 3 cylinders, $4 \times 104.34 = 417.36$ sq. in. for 4 cylinders, $4 \times 104.34 = 417.36$ sq. in. for 5 cylinders, $4 \times 104.34 = 417.36$ sq. in. The exhaust collector shown in Fig. 1

(Continued on page 76)



Fig. 3. Exhaust manifold for P & W Whirl D engine. Note exhaust manifold shown above in left is for gas and pressure view. Note also exhaust heater pipe and through exhaust manifold expansion.



The full scale wind wing model, showing details. Right view.

MARTIN 162

18 ton Navy Boat Completed Following Preliminary Tests on Quarter-Scale Flying Model.

IT CREATES A LOT OF money to make changes in the design and construction of large aircraft when they are built and, while the changes can bring much overhead reduction on TWA this is not the viewpoint of the Glenn L. Martin Company. It decided to build a quarter-scale flying model of the XPBM-1 before they built the dry hull were. The small-scale ship

was built and tested in 1957 and the engineering staff learned a lot about its performance and other characteristics before the factory started to work on the ship. Now the 18 ton patrol bomber has been built and is being

tested at Baltimore before delivery to the Navy.

The new Martin flying boat is a two-engine gull winged monoplane having a wing span of 135 ft. and an overall length of 78 ft. powered with

double bank engines of high horse power rating.

The distinctive feature of the ship's outward appearance is the "gull-shape" of its wings, which curve upward from the hull in graceful lines. The wing design was developed to secure maximum propeller clearance above water during landing, taking off and banking the engines being turned higher above water-line by its means than is practical with flat-wing models.

The ship, designated the XPBM-1 by the Navy and Model 162 by the manufacturer, is known to provide for a crew of seven, with at least three arranged to spherical positions, one in the bow and two in the wings on either side of the hull.

Other identifiable details include ex-

tractable floats under the wings and a hull internally lined in the basin to afford pressure working areas and padding space between compartments and complete living quarters for the crew. No alterations have been made as to speed, flying range, or structural details.

Immediately following first tests under full load of the new flying ship, President Martin made the following statement:

"It was not only gratifying, but quite surprising to the members of this company that during the rigid static-stability tests and maneuverability tests on water, as well as takeoff and landing, the new boat exhibited the identical characteristics recorded during the series of tests previously con-

ducted by the one-quarter scale model carrying flying model."

"We believe that in flying a man-carrying model, in addition to building the model used in model tests and having been models for this project this company once more pioneered and made an important contribution to the engineering and development methods used in the design and construction of important large airplane projects."

"Obviously the construction and testing of small scale flying models is an expensive undertaking. However, with today's records available for study, we realize that we need never have any hesitation in placing complete reliance in the performance curves and characteristics demonstrated by a small scale prototype. Tests of the 162 have furnished a complete confirmation of the earlier tests of the flying model."

Experts present during the trials of the patrol bomber observed the marked advance in hull lines, as well as the highly satisfactory aerodynamic characteristics. At no time did the hull exhibit even the slightest tendency towards porpoise. The plane was loaded "down" a twenty-one mile an hour head wind, the highest gust-point at defect in landing characteristics.



This quarter-scale, flyable, non-carrying prototype of the new Martin Patrol Bomber when flown in 1957 accurately forecast the handling characteristics of the new full-sized boat launched in February of last year.



Intensive studies of the handling characteristics on the water was an important part of the trial program for the Martin 162.



The XPBM-1 at rest between flight and water operations tests.

ARADO AR 79

TRAINING AND TOURING MACHINE

(Continued from page 31)

ing on the pilot's seat to stall, but the stall itself occurs at the critical angle of attack, which is the same as the stall angle of the C.A.A., which shows that of the stall accident has occurred in practice flying during the first few years, more than two-thirds revealed stalling or spinning. The stalling difficulty can also be avoided in a different manner by designing and building the airplane in such a way that it will not be liable to stall in steady flight at a high enough angle of attack so that the wings, or at least the outer portions, are stalled for the W-1. This was accomplished by providing a longitudinally movable ailerone and flattening the upward travel of the elevator surface. In the W-1, it was held in addition by the slant of the aileron ailerons, which gave satisfactory control and stability but too great a drag to be used where performance is important.

In the present form design the use of the limited upward elevator travel is continued, and in addition the stall occurs in such a way that the stall itself is not so severe as the stall in the W-1. The stall condition has been carefully tested. A straight wing is used, the stalling of which actually starts at the middle of the span. With the low wing monoplane arrangement used, the stalling or breaking away of the air flow is seen to start at the perimeter with the leading edge of the main wing, and the air speed and angle of attack in which the breaking away of the flow starts can be controlled by proper flapping.

A series of different flaps was tried in flight tests that extended over a couple of months. The upper surfaces of the wing being covered with wool tufts to show the nature of the air flow. With the flaps finally selected, the flow starts breaking at the rear of the flaps when the speed of the airplane is reduced to a point where the air per foot above the minimum speed, and the stalled portion gradually spreads as the speed is reduced until it includes the portion of the wing shown shaded on the accompanying figure. The outer portion of the wing does not stall even when the usual amount of elevator upward elevator is used, so that the stability and control are satisfactory in a glide with the control wheel full back even when the elevator is not lowered below the conventional amount. These factors contribute to the attainment of this condition. One is that the portion of the wing shown on the diagram stalls so definitely that the spanwise lift distribution is broken down in the center, and the outer panels act somewhat like the center of two separate lift

surfaces into itself, and can go up to a higher angle of attack before stalling. Another factor is that the greater moment of the main wing changes at the outer portion stalls in such a manner as to tend to decrease the angle of attack. Third, the loss of lift in the center of the wing reduces the downward on the tail, thus reducing the effectiveness of the elevator in forcing the tail down and increasing the angle of attack. With all three of these factors at work, the usual amount of elevator control is maintained even when the outer portion of the wing, which in this case represents most of it, is stalled. Excellent stability and control are therefore maintained during the entire range of speed and angle of attack in gliding flight.

The hinged flap over the outer section serves another useful purpose in that as the trailing edge is reduced to about five inches per foot above the minimum, a mild form of buffeting occurs which increases somewhat as the speed is further reduced. In this W-1 problem it was only to place the thrust line of the propeller so as to give balance at the same speed, either in a glide with the flaps closed or in flight at any throttle setting, and in the same limited elevator position prevented stalling throughout the entire power range. With a conventional tricycle arrangement, however, the flapless points over the center of the wing, increasing the downward lift a large amount. This added downward lift causes the downward load on the tail and then increases the angle of attack at which the airplane comes by a large amount in the order of 20° or more. On this account at the up travel of the elevator at a conventional tricycle arrangement is limited to the point where the airplane cannot be performed in a stalled glide with power full on, the plane will not fly at all with power off except in a very deep dive. Yet it is important to avoid stalling, especially with power on as well as in gliding flight, for a large proportion of all accidents involving stalls occur with power on. For example, at the time the two biplane gliders in 1937 were stalled or spinning, only 19 per cent of the cases followed engine failure.

In order to obtain a satisfactory condition in this respect, the flow over the wing was arranged so that the propeller thrust gave it a strong down moment as possible. The low wing arrangement and an inverted reflex type engine help in this matter. With this arrangement the airplane flies at approximately the same speed for any constant elevator position at any throttle setting within the range of speeds ordinary used in flight. Being a triaxial, however, the propeller arrangement presents the difficulty of not having safety of the flow at the center of the wing as the speed is decreased. In fact, the lift over the outer portion, and therefore the downward on the tail, is decreased with power on and the airplane will fly at a lower speed than with power off. At the lowest speeds a single position of the elevator therefore gives a different airplane speed for each elevator throttle setting. This conventional amount of elevator control was sufficient to stall the wing with power on and for this reason a limitation in the up travel of the elevator was necessary. Flight tests showed that when the elevator up travel was restricted to a point at which the plane could not be maintained in stalled flight with power full on, it still had sufficient elevator control for all necessary flight maneuvers including taking off and landing.

One interesting and, I believe, important feature of this ship is that, when the control wheel is held full back and the power is full on, the ship does not sink in the usual stall, but will fly along in a slow untended climb with the nose up as an unobtrusively wing attitude. Of course if the airplane has a reserve of speed to start with and the control wheel is suddenly pulled full back and held, the nose does well when up into a somewhat stall, but it will not become in the stalled state and so will immediately wing back out of it and aim the untended minor landing down has time for the wing to drop. This shows whether power is used or not and even in a power-off wing-ditch, the nose does not fall appreciably below the horizontal unless the stall is started from a very high speed.

Observation of the results of a large number of crashes led to the conclusion that in the most serious case the nose of the airplane has in practically every case come in contact with the ground at a rather steep downward angle. The airplane is thereby moved slightly in the direction toward which the nose points, but a

(Turn to page 32)

fly in long distance flights over many countries, high mountains and cold oceans in Europe, Africa, Asia and Australia, the Ar 79 has never shown itself in ideal touring aeroplane. Included in the test distance covered was the 6,300 km. service record, 1,000 mi. (1,600 km.) flown non-stop in two nights and a day. This flight pointed for the machine the speed record over 1,000 and 2,000 km, and the international long distance record for machines of this class. Compared during flight, taking in operation, a petrol consumption of 10 to 11 liters of 100 km, and high performance, made possible the circumnavigation of this flight almost half the World according to schedule. These achievements also make the Ar 79, even in the most severe conditions, an independent source of support for the private owner, — fast, comfortable, reliable and economical.

(Sent to the P.A.I. for transportation)

AR 79: Excellent features - Two seats side-by-side, comfortable cabin, excellent view, large baggage space - Retractable undercarriage, light flaps, dual control, suitable for aerobatics - 100 h.p. Hebe HM 504 A2 engine - Maximum speed 230 km/h.



AVIATION

APRIL 1938

18

ARADO FLUGZEUGWERKE G.M.B.H., BABELSBERG/BERLIN (GERMANY)

(Continued from page 36)
cannot move at high speed in a direction perpendicular to the wing surface. In an airplane we have tried to provide a combination of control and stability such that the plane is in no circumstances likely inadvertently to approach the ground with the nose down.

The limited elevator control not only means stable and controllable flight conditions throughout the low speed flight range, but it prevents spinning as well. In addition to this precaution against spinning, we have designed the airplane in such a manner that it will not balance or trim as a spin. Besides the company pilots, Robert Siskelen and Charles Snyder, expert test and stunt pilots, including Major W. George of the N.A.C.A. staff, and V. W. Bennett, have attempted to force it to spin by means of all kinds of maneuvers, both power on and power off, some even in the inverted condition, but it has never shown any signs of entering a spin. And certain of these results were made possible because of the elevator control and the full inverted elevator travel and with 20 lbs. of load at the tail of the ship to make certain that it could be held.

Glides Approach to Landing

The gliding characteristics of our present ship are not quite so extreme as those of the W-1, but the glide is somewhat steeper than that of most conventional airplanes. In this ship we have relatively less power at the moment than we had in the W-1, but out of an oval field in the W-1 could. We are therefore not providing it with a dip but are making it with the lowest possible number of controls in airplane and the smallest number of things that the pilot must remember to do.

We feel that we can get into a very small field by obtaining the maximum airspeed speed or close to it, and then coming down and flying over the ground at somewhat higher speed. With the triaxial gear and the ability to use the brakes, a short landing can be made in this manner.

Elimination of Rudder Control Pivots

In the flight trials of the W-1A, it was found that two-control operation including take-off and landing under all sorts of conditions could be carried out very well with the elevator and the triaxial system only, but the control with the elevator and rudder only was relatively unsatisfactory. In both cases successful landing in controlled landings depended on the

ability of the triaxial gear in turning and remaining along the ground.

A theoretical analysis by J. T. Jones of the N.A.C.A. staff indicates that a turning control giving pure rolling moments and no yawing moments is due to the operation for two-control operation, although a small and varying amount of yawing moment is required to produce perfect control into and recovery from turns with no loss of stability in slipping. Ordinarily conventional airplanes can be used reasonably well, but the effect of their inherent adverse yawing moments may be extreme in the forward windbreak stability of the airplane, and a rather large amount of slipping and skidding is then a result. The use of conventional airplanes added to the turning control in a two-control system has the disadvantage also that these airplanes are likely to be built as the stall is approached. The slot-lift airplane used on the W-1A had no yawing moments of any importance and they gave satisfactory control but no mentioned previously, their drag was excessive.

The present Kross plane is constructed in such a manner that the pilot can take his choice as to whether he flies it with two controls or with the conventional three controls. The system can be changed from the conventional three to the two control as required in a few minutes, by adding a link connecting the ailerons and rollers together and removing the rudder pedals. Turning the control wheel then causes the elevator to rise and, and somewhat automatically, and turns the airplane whether it is flying in the air or riding on the ground.

At first we had the nosewheel steered by the rudder pedals when the conventional three-control system was in use, but in our surprise cross reviewed pilots when having would try to turn the airplane by moving the control wheel as in an automobile even though it steered only the ailerons, and those in the opposite direction from that which they were trained to use as in making a turn on the ground. We are therefore providing for the nosewheel to be steered by the control wheel whether the two or the three-control arrangement is in use.

By holding the rudders to the take runs in the two-control arrangement the optimum relation between rolling and yawing moments can be obtained for any flight condition. In our case we have chosen for this relation the best speed condition because it is the most difficult condition in which to obtain satisfactory control. At high speeds

our system therefore provides slightly larger yawing moments than would be ideal, but this can be varied so that it is only at an extremely sharp turn is made suddenly at high speed. Such a turn is made but rarely, and a bit of slipping and skidding accompanies it as in a good experience. A number of skilled pilots have flown the plane with both the two-control and the three-control systems, and it was an interesting observation that the slipping and skidding during the flying, as indicated by the ball in the bank indicator, has been relatively less with the two-control than with the conventional three-control arrangement in use, unless the pilot paid special attention to flying carefully with the three controls.

Our able test pilot, experienced in flying and testing all types and sizes of airplanes, flew the plane alternately with two, three, two, and three controls on an extremely gusty day, and he was considerably surprised to find that he needed less lampness with the two than with the conventional three control arrangement. It seems that with only two controls he realized that he had incomplete control over the attitude of the plane and so he did not try so hard to overcome the effects of the gustiness. When he let the stability do the work for him he apparently had a smoother ride.

This brings up a change in point of view that it seems an experienced pilot of conventional airplanes cannot pass through before he can be satisfied with improved operation. He has been accustomed to controlling the attitude of his airplane about all three axes as well as the flight path and the speed. With two-control operation he must be willing to surrender his control in yaw and to rely upon the help of the airplane to prevent slipping and skidding, and upon the stability of the landing gear to handle the drift in a cross-wind landing. Not used to this fully confident that the airplane itself will take care of these things satisfactorily and without steady can be he is required to fly a two-control airplane with a feeling of comfort and pleasure.

An interesting set of trials that brought out one of the advantages of two-control operation was recently made by Siskelen. On a day when the high wind he made a series of take-offs from the College Park flying field, each one simulating a landing operation and a forced landing by closing the throttle at a delivery point and then making a landing back on the field. During the trials he cut off his

(Purs to page 37)

AVIATION
April 1935
11



CONSOLIDATED
Aircraft CORPORATION
SAN DIEGO • CALIFORNIA
ESTABLISHED 1925

SEE THE *Consolidated* PBYS
CO-STARRING
as
NATIONAL DEFENDERS
in
"WINGS OF THE NAVY"



son track, and is powered from a generator-driven 50 gva power generator. The motor transmitter, the radio set, supplies 750 watts antenna load or 300 watts 100 per cent modulation, is gas powered, and feeds a non-directional antenna. The reflecting array for the beam transmitter, or secondarily of the rear of the track. A ground is obtained by driving a rod into the ground, or by the use of a radial counterpoise. As a communication system is essential all such by tube is also provided, and both an antenna set up to one side the glide path.

"Gyromatic" D-F

Ward Davis of CAA and Lear Developments Cockpit Instruments in New Canaan

The Lear-Davis Gyromatic Direction Finder is an extremely reliable unit as accurate "compass-reading" radio d.f. as airport map, and a gyro compass for the "largest aircraft" type. The radio d.f. is a modified Lear Type ABE-5 compass with a motor-driven loop which mounting itself on the roll position (moving toward any station to which it is tuned). From the loop housing a flexible shaft leads to the gyro compass instrument, shown as the accompanying illustration. The gyro instrument indicates the direction of the ship's flight on two separate scales, one turned through a conventional window on the side of the instrument, and the other consisting of an open loop compass card mounted on the top of the case. The glass cover of this upper indicator can be opened readily and a circular map inserted on the compass face. The map contains the location of the radio range beacon station and the support ranges as well as the magnetic bearings of the nearest known land mass. The station is so placed on the map that it falls directly on the center of the card. The entire map frame, with the gyro compass mechanism.

When the map is transposed into a mounted and so arranged that it is rotated directly by the flexible shaft leading to the compass loop. As a screw on this scale indicates the direction of the loop roll position relative to the forward air line of the ship which is shown as a fixed line as the ship moves later in the instrument.

In using the instrument, the radio compass is first tuned to the beacon station (or reverse bearing) as the support. Then the pilot picks out the magnetic bearing path he desires to

come to on, determines the magnetic compass bearing of that run-way from the chart on the compass face, and the gyro wheel is then brought to that bearing. If he then sets the radio compass to an "homing" figure, by keeping the loop aimed directly on the forward air line. At the same time he attempts to keep the gyro heading, as indicated by the black triangle on the magnetic bearing previously set up. If it is impossible to keep the gyro and the radio compass head up the indicator is that drive is being caused by a side wind. The difference between the homing angle and the gyro bearing is then equal to the side angle necessary to maintain a straight flight along the co-course wind.

The compass indicates the position of the nose of the plane at the station by turning as heading. When this occurs the pilot knows his position and heading about the support and runs this course the radio compass. When landing, the runway line on the map will be parallel to the fore-and-aft axis of the ship.

The advantage of the instrument like that of the Duffell system of blind landing is in its integration of the information of two instruments, the radio compass and the gyro compass. The pilot in the whole situation confronted in the calculation of one instrument, and is thereby relieved of much mental effort. Among the possibilities opened up by the new development are automatic orientation, automatic track (dive) correction, homing flight, simplified instrument approaches, and parallel flight (blind)



Above: The Lear-Davis "Gyromatic" combined compass

operation from a direct radio order on an established course or to off-airway points.

Information

For Third Class Radiotelephone Apparatus

Twelve hours of lessons, helpful for applicants for Third Class Radiotelephone Operator's License, are contained in "Radiotelephone Third Class Information" published by Radio Information, 5216 W 4th St., Chicago. The booklet induces the responsibility to their candidate, states the privileges and responsibilities of the third class ticket, gives the answers to twenty typical examination questions, suggests proper operating procedures, and defines 50 commonly used technical terms. It is recommended to those who have but little knowledge of radio, and who desire to meet the requirements for this operator's license.

Text

British book covers fundamentals and practice of modern D-F work

A new volume on this attractive all engineers engaged in design, power and operation of direction finding equipment is "Wireless Direction Finding" by S. Kern, published by E. & S. Living, London, 5, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129, 131, 133, 135, 137, 139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159, 161, 163, 165, 167, 169, 171, 173, 175, 177, 179, 181, 183, 185, 187, 189, 191, 193, 195, 197, 199, 201, 203, 205, 207, 209, 211, 213, 215, 217, 219, 221, 223, 225, 227, 229, 231, 233, 235, 237, 239, 241, 243, 245, 247, 249, 251, 253, 255, 257, 259, 261, 263, 265, 267, 269, 271, 273, 275, 277, 279, 281, 283, 285, 287, 289, 291, 293, 295, 297, 299, 301, 303, 305, 307, 309, 311, 313, 315, 317, 319, 321, 323, 325, 327, 329, 331, 333, 335, 337, 339, 341, 343, 345, 347, 349, 351, 353, 355, 357, 359, 361, 363, 365, 367, 369, 371, 373, 375, 377, 379, 381, 383, 385, 387, 389, 391, 393, 395, 397, 399, 401, 403, 405, 407, 409, 411, 413, 415, 417, 419, 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BUYER'S LOG BOOK

What's New in Accessories, Materials, Supplies, and Equipment

Eclipse Generators

New types produce 1500 watt out put without increase in weight.

Direct-coupled output with variable no. of turns in weight in the retarding means of the latest addition to the Eclipse line of generators. The new generator produces 1,500 watts and is available for either 12 or 24 volt d.c. operation. They are rated at 15 volts, 100 amperes and 30 volts 50 amperes output, respectively. The horsepower input is approximately 2½. They may be prepared for either direction of rotation, one or two wire systems, and with either the square or round generator mounting flange incorporating 6 studs three splines or 36 studs available spline or no-spline. Shocking is optional in Air Corps type or standard 1½ in.—18 amp. nominal. The 12 volt generator weighs but 36½ lb. and the 30 volt, 56 lb. The full charging output is obtainable over a generator speed range of from 2400 to 4500 r.p.m. An integrally mounted fan provides the necessary cooling. The 20 volt set utilizes the conventional type of flexible rubber coupling with solid armature shaft, while a torque shaft of the gear type with ball-end torque shaft is connected to the 15 volt generator, to absorb torsional engine impulses.

Additional features provided are the balancing of the ball bearing supported armature shaft both statically and dynamically, improvements in brush spring design, to improve commutation and give longer brush life together with more simplified brush rigging, resulting in more efficient and dependable operation.

Conventional type shock-mounted control boxes of the standard and detachable types, incorporating a voltage regulator, current limiter and reverse current relay, are available in five-volt operation, automatic regulation of the generator output. Shock mounted control panels, for portable line installation, include a voltage regulator and reverse current cut-off for installations of the type requiring this form of control.—*AVIATION*, April, 1939



Two of the new Eclipse high output generators.

Indicating Wrench

Red signal flashes when stress reaches predetermined maximum

Modern maintenance requirements have made it essential for every aircraft mechanic to be equipped with a wrench indicating exactly the such operation as tightening spark plugs, cylinder head nuts, or cylinder head down studs, connecting rod bearing nuts, manifold bolts, etc. A number of torque indicating wrenches have been developed. One of the newer such wrenches is the Toriflash, offered by the Blackhawk Mfg. Co., of Milwaukee, Wis. The Toriflash is simple and light in weight. Basic principle is deflection of the steel wrench handle proper under stress. This deflection is indicated in such pounds or foot pounds according to spring constant and when the required stress is reached the wrench flashes a red warning signal. This is provided through incorporation of a standard sized flashlight battery and bulb in the handle, and means the wrench is especially valuable for use at night or in dark corners where a scale reading would not be easy.—*AVIATION*, April, 1939

Way Control Valve

Lowest addition to Aircraft Accessories line of hydraulic equipment

Latest development in the line of hydraulic actuating equipment manufactured and distributed by the Aircraft Accessories Corporation, of Glendale, Calif., is a four-way directional control valve incorporating several novel features. The Aircraft Accessories valve operates with very high pressure, making it practicable to mount it in the plane at points remote from the point of control, operating the valve by means of rods or cables. Under 1000 p.s.i./sq. in. hydraulic pressure the valve operates with 4 lb. of force turned on a 2½ in. handle. It is positive in its action and absolutely leak proof, having no internal packing subjected to wear. All internal parts are standard and interchangeable, and are so arranged that they may be removed for servicing without disconnecting the plumbing or removing the valve from its mounting. To meet Army Air Corps requirements the valve is designed so as not to be affected by changes of pressure, and when valves in the system may be operated without interference of fluid from one mechanism to another under an 1800 p.s.i./sq. in. test 1000 cycles failed to produce noticeable wear on any of the parts, indicating high metal life for the valve without servicing or replacement operations.—*AVIATION*, April, 1939



Four way hydraulic control valve by Aircraft Accessories



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TULSA, OKLAHOMA

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CHARLES P. O'CONNOR knows his engines. As a former American Airlines pilot and the present manager of the Barnes Air Service Company of Westfield, Mass., he has had plenty of experience with all kinds. And he tells us the new Lycoming "50" is "a chip off the old block." He says: "After several months of operating a Coker Sport equipped with a Lycoming '50', I can say this new member of the Lycoming family is most efficient, performing like a veteran, and giving the same confidence and satisfaction Lycoming has always given. It combines the qualities one most desires—effortless power, smoothness, economy and dependability."

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L LYCOMING L

RELIABLE ENGINES FOR MILITARY, TRAINING, PRIVATE AND COMMERCIAL AIRPLANE

AVIATION
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Shark Position Finder



Star Position Finder

Star Position Finder

Pilot need only see head to locate map position with this device.

Circle, window, given, transport pilot six eyes and six hands let will indicate the Shark Position Finder, designed by Capt. Hester Stark, veteran pilot and recognized authority on air navigation. The Shark position finder may be operated with one hand and eliminates merely the manual plotting of position, locating the map position of the airplane on the basis of radio signals picked up by the radio magnetic direction finder. The position finder employs a replaceable transparent map of the radio range and broadcast stations at as low 120 miles in diameter covering the radio wave while the pilot is flying. Twenty-two radio ranges cover the entire country. Research this map are two dials, rotatable and independent which have parallel lines. The pilot takes in two radio stations in



Cable Wiper and driving head, Right. Shaded wheel with rotating pump for device cable built into head.



low direction finder and transmits their magnetic bearings to the position finder by properly shaping the filed lines. Where the lines of the two dials intersect, an arm through the transparent map, it has map position. All three-pointed star, Airline pilot, use the Shark position finder, and the instrument has been made available in other offices and private pilots—AUGUST, April, 1939

Sterling Steelductor

Seven Round, Stainless-Steel Wire Good in New Ignition Cable

Known as Sterling Steelductor, a new ignition cable developed by the Sterling Cable Division of the Sterling Cable Company, Detroit, Mich. A large percentage of Silver wire has been built using such ignition cable for some two years now. Most improvements in ignition parts—wipers, seals, contact improvement in engine efficiency, are chosen for the new cable. Chief characteristics of the cable is its low "voltage drop," which usually means that the cable itself absorbs very little of the electrical energy inducted through it. Advantages in engine operation claimed for the new Sterling cable are: 1. Easier starting, 2. Increased top speed, 3. Lower idling speed, 4. Reduced burning of spark electrodes, 5. Less scaling from heated plugs, 6. Avoids internal corona, 7. Reduces effect of heat on cable insulation, and 8. Less cable deterioration. Chief feature of the cable is the use of only seven strands of stainless steel wire, which provides a proportionally greater thickness of insulating material—AUGUST, April, 1939

Windshield Wiper

Electrically operated rotary wiper has slower field attachment.

A major improvement in bad weather vision has been made by Air-Automation, Inc., of Garden City, N. Y., with a new electrically operated rotary wiper which is said to keep a circular area gradually free of rain, ice, dirt, spray or snow under any conditions. A special design field attachment provides for clear vision under any conditions. The driving shaft of the wiper passes through a hole in the glass and carries the blade, the wiping edge of which is a ground composition material not affected by oil, gasoline, kerosene, or extreme cold. The rotary blade may be controlled at any speed up to 2,500 rpm.—AUGUST, April, 1939

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The SIKORSKY "FLYING DREADNAUGHT"

Powered by four Twin Wasp engines, the XPBS-1, long-range patrol bomber, is one of the Navy's greatest weapons of aerial defense.

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ONE OF THE FOUR DIVISIONS OF UNITED AIRCRAFT CORPORATION

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THE AVIATION

NEWS

REPORT, COMMENT, FORECAST

DANIEL SAYRE

C. B. McKeen, Paula Court
Bene Stokholm, Washington
B. E. Smith, New York

APRIL 1939

Army Changes Rules on Pilots, GHQ

(Story on page 51)



McKeen and Smith

SATURDAY TO THE FIVE: Fort Belvoir, Alaska, New York's airport. The air terminal for land and sea transport, rather than one station as WPA men work in three shifts, is now in ready by the time the World's Fair opens. It will have been built away from the city to not touch Manhattan.

"CHRISTEN THREE YANKEE CLIP PER!" Mrs. Roosevelt does a beautiful thorough job on Pan American Airways' 50th anniversary in the trans-Atlantic transport summit. The audience during the ceremony is just those Pan American President and General Manager.

WPA Staff



AVIATION

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Big-4 Air Lines Report on 1938

American Makes \$213,262

In its annual report released March 16 by its president, C. E. Smith, American Airlines shows a net profit for 1938, after provision for income taxes, of \$213,262. This compares with a net loss of \$24,877 for 1937. Operating 15,174,792 revenue miles during the year, the company had an average profit of 1.38 cents per revenue mile flown.

Passengers carried in 1938 were 269,200 compared with 208,621 during the previous year, an increase of 19.3 per cent. Revenue passenger-miles jumped 14.4 per cent to 244,018,000. April in 1937, as in 1937, American Airlines transported 38 per cent of all passengers carried by the domestic air lines.

American Airlines' operations are at its outstanding safety level. At December 31, 1938, it had flown 45,000,000 airplane miles and carried 1,814,077 passengers and 148,226,000 passenger miles without an accident involving passenger fatality. Then, on January 14, 1939, the East winged three all-ports of operations without an accident involving passenger fatality.

American's profits and loss on its transcontinental route. It carries a line on mail pay of 50¢ per mile for the first 300 miles and 2.5¢ per mile for each additional 100 miles.

New York-Tot Worth average and 80¢ per mile for the first 300 miles and 2.5¢ per mile for each additional 100 miles on the Port Worth-Las Vegas service. One of the other transcontinental lines carries 50¢ per mile for the first 300 miles and 2.5¢ per mile for each additional 100 miles. The maximum in each case is 40¢. All these companies are carrying the same type of mail in a single study since for the same unit of distance, American has filed a petition with the Civil Aeronautics Administration for a reduction of this differential.

Five of the ten additional passengers.

per Douglas biplane which American Airlines had on order for delivery this year will be delivered by March 30. The remaining five are to be delivered during May.

United Losses \$397,221

In its annual report for 1938, United Air Lines disclosed a loss of \$397,221, as compared with a loss during 1937 of \$714,461; this loss was recovered during the fact that passenger revenue increased 6.08 per cent, and total revenue increased 7.77 per cent. Expense revenue decreased 7.50 per cent. Total operating expenses and losses were \$475,515, or 5.54 per cent.

Bureau 1938 United flew 15,146,000 revenue airplane miles. Revenue passenger-miles increased from 214,018,000 in 1937 to 244,018,000. Air mail carried amounted to 4,374,100,000 pounds-miles, 5.25 per cent above the preceding year. Air cargo total was 1,000,000 pounds-miles, a decrease of 20 per cent.

The company is now in a better position to operate without an accident involving passenger fatality. It is reported that it may receive some adequate compensation for the transportation of mail—provided by the Postmaster of United strongly upon a possible basis of mail pay.

Eastern Profit, \$354,249

Eastern Air Lines' President, E. V. Rickenbacker, announced in his annual report for 1938, that after deducting for depreciation and amortization and for Federal income taxes, the company made a net profit for the year, 1938, of \$354,249. This compares with a net profit of \$287,973 for the previous year. New routes opened during the year include air from New Orleans to Tulsa-Newark and Tampa and from Tampa to St. Petersburg and from St. Petersburg to Orlando and Houston to San Antonio. These routes will give

Eastern a total route mileage of 3,200 miles running in four touch to across lines among domestic air lines.

In January Eastern Air Lines was awarded the contract to carry mail in a remote airfield route from the coast of the Philippines first office in Cebu. The contract calls for five round trips per day, daylight operation, on days per week for a period of one year. The pay for this service will be 10¢ per mile. It is hoped to start operation of this service some time in June with a Curtiss Aeroplane.

The machine will be the first of a new design offered for mail and express service. In general construction it will be somewhat similar to the military models supplied to the Army Air Corps. It will be a one-place ship with closed cockpit and a large mail compartment. Equipment will include complete navigation instruments for fixed flying and the existing requirements of mail-handling.

TWA Losses \$773,263

TWA's annual report for 1938 dated February 17, 1939, shows substantially increased business and operating revenue over 1937. However, increased operating expenses, which include an increase of \$60,000 in mail and \$60,000 in fuel as well as higher airport rental and prices of materials and maintenance, more than offset the gains. The net loss for 1938 was \$773,263, as compared with \$488,024 for 1937. This loss, the report is pointed to give credit to the additional and revenue granted by the extensive mail route increase authorized by the Interstate Commerce Commission in its order of December 22, 1938. TWA paid out that it carried 18 per cent of all air mail transported in the United States, but receives only 16 per cent of the total payments made to air mail carriers. It is therefore being paid in a favorable ratio in its application for further increase in mail pay.

During the latter part of 1938, service was inaugurated on a new route between Phoenix, Arizona, and Boulder City, Nevada, where passengers are made with the transcontinental and the Frontier City-San Francisco.

TWA now has an average 32 Douglas, ten of which are Republics, one are Republics. Formers are Lockheed-passenger DC-2s.

In recognition of a large increase in traffic during 1938, the chief of the

San Francisco and New York World, TWA is launching the most ambitious flying schedule in its history. The new program is expected to cut the airfare on the route to \$175,000 in advertising, equipment and operating expenses during the year, and will add nearly 200,000 miles and miles monthly to its present flying list. In several instances, notably the Chicago-New York service, previous schedule frequencies are doubled.

It is understood that the regulations, as drawn up, will be specific in stating that an officer holding such rating will not perform duties unless he also holds a better Pilot's rating at the time.

The new standards for physical examination are designed particularly to make for light duty older officers who are no longer able to do strenuous physical tests given to new pilots or candidates for the training course. This profit is a relaxation of the tests for vision, hearing, and general robustness, but none these tests are to accompany the new testing system, such pilots as are unable to pass the more difficult tests will not be permitted to actually fly the airplane.

The Air Corps Board expected that the task of setting all officers would be completed by April 1. When they are in effect, the three classes of physical examination will be applied to them.

Class 1, the most stringent tests, will be applied to applicants for flight training. These undergoing flight training, rated under pilots, pilots and combat aircraft.

Class 2 will be applied to under pilots and combat aircraft who can not meet the standards of Class 1, and yet are not holding and experience are just as to compensate for the lower physical standards.

Class 3 will apply to rated command pilots and technical observers. The temporary suspension of the Air Corps Technical School at Maxwell Field is being done so that all Air Corps officers who have not taken the course may do so now. In this manner the war may be due to gain insurance officers through the school to come to they are due for it.

Although these are now about 180 Air Corps officers who have not taken the course, a number of them will be some technical officers and go to M.I.T. to get their degree, and some of the technical officers, therefore, it is expected that one year of the short course will be able to take the rank of the existing officers. The school can then return to its normal program.

In the creation of the new rating "Command Pilot," who will be the senior member of the combat class, the "Chief of the Staff" of the technical schools, therefore, it is expected that one year of the short course will be able to take the rank of the existing officers. The school can then return to its normal program.

One of the main reasons for the new rating "Command Pilot" is that the handling of personnel is different. In addition, since the Office of the Chief of the Air Corps handles research and procurement and therefore Jervis, who is in charge in the way of new developments, it is better personnel to pilot training with a view to future material.

The reclassification of flying officers is a direct result of the investigation showing some months ago following the death of a few of the pilots, some experienced men while piloting airplanes. It was desired to keep the younger men with greater physical reactions at the controls of the planes, but at the same time to take the advantage of the wealth of experience gained by the older officers in their long flying careers. This has resulted



NIGHT FLIGHT: A remarkable high light photo of a BT-9 over Randolph Field

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Taylorcraft

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Southern California Seeks New Funds

J. K. Northrop to head field with new manufacturing company

THE IDEAS OF BLAKE based new financing programs and arrangements of new aviation manufacturing ventures focusing mainly in the semi-desert Southern California area. As we go to press, negotiations are in their \$1,000,000 to \$1,500,000 stage. Southern California firms will seek the market within only a week's time. More than half of the new money will go into entirely new ventures.

Heading the list of new and interesting projects is Northrop Aircraft, Inc., which is scheduled to have the backing of capital supplied by a group headed by Laurence J. Cole. Preliminary plans are said to call for a total investment of from \$1,000,000 to \$1,500,000, with the creation of a new plant at the Los Angeles area for manufacturing military aircraft designed by John K. Northrop. It is understood that Northrop will serve as chief engineer of the new firm, and Gary Irving, now assistant general manager of the El Segundo Division of the Douglas Aircraft Company, is to head the production department.

Largely Los Angeles financing is that of Lockheed Aircraft Corp., which owned 112,454 shares of common stock, at \$14 a share, on March 15. The company from the site of this additional stock will total \$2,779,926. According to its 1937 consolidated statement (the company will use approximately \$300,000 for the construction of new buildings and facilities, \$100,000 for the purchase of additional tools and equipment, and \$140,000 for development of the new model 12, model 22 and model 42 airplanes. The balance will be used for working capital.

Between Manufacturing Company, now in the process of being formed, the corporation is to be formed at about \$100,000 shares, 50 in offer at market price, which is now about \$14 per share. The money would be used largely for working capital and development of new designs.

Two entirely new firms expected soon are: Allied Aviation Corp., offering 10,000 shares of \$1 per value stock to finance production of the Mustang (armed in-line engine), and Aerojet Development Corp., manufacturer of hydro-aqua aircraft systems, which will market 10,000 shares of \$1 per value common stock. An entire non-manufactured firm also expected in the vicinity of Vero Aircraft Co., subsidiary of Lockheed and developer of the new plane powered with the Duxbury engine, developed by the Messersmith Co.

Harlow Aircraft Co. has recently been formed under the presidency of J. B. Alexander, with Max B. Smith as general manager, John C. Kelly, vice president in charge of sales, W. F. White, treasurer, and H. F. Kossan, chairman of the board. Incorporated in California in the amount of \$1,000,000, the Harlow company is starting production in a 10,000 ft. hangar located on Alhambra Airport. Harlow aircraft will include the present Taylorcraft cabin.

complement and a new two-place tandem aircraft.

At least 100 other airplane or aircraft equipment manufacturing companies are expected to be formed in the area, with several due to reach the financing stage shortly.

Douglas Sales at \$29,347,474

DOUGLAS is now records in production and earnings for the fiscal year ended September 30, 1938. The Douglas Aircraft Company has reported net income for the period of \$1,147,000 after all charges, which is equal to \$1.14 per share on the 100,000 shares of common stock. Sales for the year ended September 30, 1938, were \$29,347,474.85, compared with \$28,716,311.18 in 1937. This is believed to set a new all-time high for aircraft production in general by any one manufacturing unit. Experimental expenditures for the year ended September 30, 1938, were \$1,147,000. The company's net deferred experimental expenses of \$1,147,000. In its balance sheet as of September 30, 1938, the amount of \$1,147,000 was reported against the DCA, which will represent an amount of \$1,147,000. Current assets as of Nov. 30, 1938, were \$1,147,000. Current liabilities as of Nov. 30, 1938, were \$1,147,000. The company's net deferred experimental expenses of \$1,147,000. In its balance sheet as of September 30, 1938, the amount of \$1,147,000 was reported against the DCA, which will represent an amount of \$1,147,000.

On the basis of the announcement early in March, it is believed that the company's net deferred experimental expenses of \$1,147,000. The company's net deferred experimental expenses of \$1,147,000. In its balance sheet as of September 30, 1938, the amount of \$1,147,000 was reported against the DCA, which will represent an amount of \$1,147,000.

Lockheed Doubles Deliveries

LOCKHEED production and earnings are reported for the fiscal year ended September 30, 1938. The Lockheed Aircraft Company has reported net income for the period of \$1,147,000 after all charges, which is equal to \$1.14 per share on the 100,000 shares of common stock. Sales for the year ended September 30, 1938, were \$29,347,474.85, compared with \$28,716,311.18 in 1937. This is believed to set a new all-time high for aircraft production in general by any one manufacturing unit. Experimental expenditures for the year ended September 30, 1938, were \$1,147,000. The company's net deferred experimental expenses of \$1,147,000. In its balance sheet as of September 30, 1938, the amount of \$1,147,000 was reported against the DCA, which will represent an amount of \$1,147,000.

slightly placing Lockheed's total backlog at a new all-time high for any aircraft firm in previous history. Contracts under which Lockheed is now working call for delivery of almost 500 planes. Sales contracts alone. No mention is made of production orders on the annual new Lockheed backlog. The company was made recently in the Lockheed 10A, a light bomber version of the Model 22 experimental airplane. The plane is being built, under a contract for ten, for the North Atlantic Coast Island, and is likely to receive a number of orders in its top speed of better than 250 mph. Lockheed is known to be working currently on a major engineering project, but details are not yet available for publication. A number of new planes are under development and extensive field and wind-tunnel research work is being conducted on present models. A report will also be made of a novel short study.

Mid-Continent Buys First Vega

VEGA AIRPLANE COMPANY has announced the sale of its first plane in a statement by Max Smith, president. The new plane, a mid-continent Vega 100, will go to Mid-Continent Airlines, of Kansas City, early this summer, and will be used for passenger service on the northern part of the Mid-Continent system. The Vega will carry five passengers and operate at a maximum cruising speed of 180 mph. It is of all-metal construction, of low-wing configuration, with retractable landing gear, and is powered with the new Pratt & Whitney piston engine at 100 h.p. Its take-off

Ditch Army Orders

ON the basis of the announcement early in March, it is believed that the company's net deferred experimental expenses of \$1,147,000. The company's net deferred experimental expenses of \$1,147,000. In its balance sheet as of September 30, 1938, the amount of \$1,147,000 was reported against the DCA, which will represent an amount of \$1,147,000.

Big Contract to Wright

WRIGHT AERONAUTICAL CORP. has received a \$2,117,250 contract from the War Department for the type R-159 engine. The engine was for the installation in single, bi-motor, and tri-motor aircraft. The engine has been tested, and is to be made available in quantities for these planes. It is estimated that the order will fall between 200 and 250 engines.

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What's New in This Month's News



REDAJIST—L4404 S. Irvin, awarded one of the Royal Aeronautical Society's most cherished medals—for his work with 'airships' of course.



TRAVELER: W. S. (Bill) Lindsey, export sales manager for the B. O. Corporation has sailed for Europe, Asia and very briefly.



NEW HANGER. According to its Web site, the new 500 hp Hymatrac is the smallest tractor. William A. Garry, Sales and Service Manager of the Ranger Engineering Corporation, Duxbury, Mass., says the new Hanger is the lightest hp tractor on the market. Garry says the new Hanger has already produced much interest from U.S. military and naval experts and from manufacturers of transport equipment. The company has declined to allow further development to a next larger unit.



FLYING ADMIRAL: Life in 1911 a young Lieut. John H. Towers, U.S.N., qualified for his F.A.A. license, thus becoming the third Naval Aviator in America. Thereafter he helped organize the first flying school at Pensacola. He was an

assistant to the director of Naval flying during the war. He commanded the flight of the NC birds. He has indeed been Assistant Chief of the Bureau of Aeronautics. Last month he was named Chief.



HARLOW AIRCRAFT—left to right, street: J. C. Kelley, J. Vice President Sales, St. B. Harlow, Vice President and Manager, J. B. Alexander, President



STYLE NOTE: Capt. and Mrs. Hal B. Froberg (He's Not really a real Division Superintendent) demonstrate the art of the interview.



SATISFIED CUSTOMER: Capt. H. B. de Kruyf, New Orleans, representative of the Netherlands East Indies Government and Queen L. Martin, was in front of the 100th airplane to be delivered to Royal Netherlands East Indies Air Force from the Martin factory in Bellville. As a matter of fact a Martin plane was the first ever purchased by that air force, in 1934.



HONORARY FELLOW: Major Lester D. Gorman, (left) Secretary of our own Institute of the Aeronautical Sciences, and one of those most responsible for its existence, was last month properly honored. The Royal Aeronautical Society picked him as Honorary Fellow—the third American ever to earn



ALL AMERICAN: Almya, Dr. Lytle & Adams, inventor of IMH air line's unique pickup mail system and its vice president, Balow, Richard C. DuPont, President



flight to test engine equipment but also jet. This flight was from Los Angeles to Minneapolis and involved an altitude of 31,000 feet. Airline flight was also made to Minneapolis on February 20 and at Chicago on February 28, when airplanes and doctors were taken up for a demonstration of engine maintenance.

Fair Helps W.A.E.

Wenger's Fair Traffic is already being referred to when travel increases over the Western Air Express system, according to an announcement by Tom Wenger, Vice-president in charge of traffic. According to a report issued by Middle February, 1939 revenue passenger miles increased by 500,000 over a same high of 421,500, as compared with 395,300 in February, 1938.

Your Berth is Ready

A NEW AIRLINE SERVICE, DESIGNED to act-off sleepers on railroads, has been arranged at Kansas City and Chicago, whereby passengers aboard sleeper planes will be allowed to remain in their berths until the take-off at through plans for Los Angeles and New York. In New York and Kansas City passengers who desire plans according to an early hour will be allowed to remain on the ship up to an hour after scheduled arrival.

United Gains in West

UNITED AIR LINES has announced that since the opening of the San Francisco Port, traffic on its Pacific Coast route has increased 50 per cent. This resulted in an increase in schedules over the system of 1,000,000 miles a month, a percentage of extra services which are being on the Pacific Coast.

AIR TRANSPORT INDICATOR

March 1, 1939

118.7

Which is the index of the revenue passenger miles reported by the Trans-Port Association as certified by all domestic airlines during February, 1939, to the corresponding figure for February, 1938.

The year indicated by two small stars is the base year for the index, set at 100.000 passenger miles for February 1938.



BRITAIN'S WINGS GROW—FASTER: Rapid view of assembly line in Air-Strong Whitehead factory

AVIATION ABROAD

The British are feeling better these days since the world is not that by the first of April they'll have 1,500 Avian planes in the Metropolitan Air Force. The last thing about it is that it means the expensive schedule last spring is being held. According to the plan announced then the end is 1,500 low wings at home plus around 1,000 overseas and with the first by March 1940, but the bulk arrived London about the first of last fall when they first began to be used extensively.

One thing that cheers the British is the fact that their production rate is growing up in Germany's, and according to the *Kriegsflug* West it's doubled in the last year and is still going up. The rate has begun to catch it double again this year. Then shortly after with the fact that the last big order for new aircraft this year (around 1,000,000,000) is just about twice last year's. The big question is in the south of a military secret to be answered—How many modern ships are being placed in service and also the new modern fighting strength. The job of rebuilding the Fleet Air Arm and getting it turned over to the Army in preparation for the war, is now expected to begin to stop about half way to avoid getting the work with too many ships during the first few months of the war. The Air Ministry will not mean to handle all primary training during this year to the Admiralty for advanced flying. It will also train the necessary mechanics and handle all aircraft personnel, which is a way to keep the two services from

fighting over who gets the planes built first. The British announcements don't bother General Goring, who said Germany would maintain her lead in the air no matter what and called for "patience in London and of a quality that some undoubtable." The point is that the Germans have also taken up better business, but they're slowly going at it in a little different way than the British, who concentrated their around London first and are now spreading them to other locations. The German plan seems based first of all on outstripping an defense more about thirty-five miles wide had helped the French, and concentrating a big part of the defense from Berlin, and Berlin, and Berlin—up there as a sort of aerial Magedon. But beyond these come the defense around important centers, but the Germans apparently put more trust that other countries in being able to fight off while before they reach their objectives.

The British need time, however, to do a little more business in 1939. In the first eight months they shipped about 250,000 worth of normal and parts, the largest and of a group in Venezuela, Germany, and Greece. Daily exports, as well as 140 ships arrived in 1939, which alone, at the end of 1938 expected, the newly mentioned war start had been strictly British inventory to selling from Germany—British ships in the last Air Force. That fact between Canadian Air and Foreign and the British Government for a Mexican grant looks on of its daily

HARLOW SCOOPS THE INDUSTRY

NEW PRIVATE ALL METAL TRANSPORT KNOCKS INTO A COCKED KAT EVERY PRECONCEIVED NOTION ABOUT PERFORMANCE!

Performance never before approached by any commercial airplane, the Harlow cruiser at 160 miles per hour and delivers 17 miles to the gallon of gas with 100 hp. Vickers engine. Coupled with economy of operation which has been made available but it has been so clearly demonstrated, indirectly as a consequence as the standard by which all future commercial airplanes will be judged. The strong character of the Harlow are unusual for a private airplane and naturally balanced and stand throughout with the same strong and sturdy construction as handle stress in the air or on the ground.



Only the Beginning

And that's only the beginning. This marvelous craft is equipped with a fully retractable, electrically operated landing gear, retractable or locked in its normal position. The specially designed, electrically operated flap system leading up to 40 miles, and with the aid of retractable landing gear the ship is a full step in 240 feet.

Speed and Economy

Cruising at 120 m.p.h. with four per cent and burning the 35 gallon tank requires sufficient fuel for 600 miles of cross country flight.

And There You Have It

When Harlow engineers started work on this design they had only the perspective in mind. It wasn't power, speed, maneuverability, high cruising speed, unusual economy and low first cost, 14,000 plus "automobile cost", but speed, landing characteristics and a gas capacity of at least 500 miles. The airplane it should resemble the latest commercial plane. How the three main requirements have been exceeded this only be truly appreciated by those who see and fly the ship.

Air Conditioned and Automobile Comfort in the Air

The new all metal Harlow cruiser, built to the idea of a private car in the air, provides luxurious comfort for four persons. Ample legroom space is found in a separate compartment.

Wide windows and a large wheel provide an exceptional view in all directions. Perfect ventilation is obtained by bringing fresh air through radiators from the leading edge of the wing.

Two of the best known sound proofing engineers have collaborated in reducing the noise level of the Harlow to less than that of the latest commercial transport.

Low Power, High Performance

The Harlow is powered with the Warner Super Sixteen radial engine which develops 145 hp. at 2500 r.p.m., but owing to aerodynamic clean design of the Harlow with its retractable landing gear the airplane is required here to make no improvement in steady speed above cruising at 160 m.p.h. to 50 percent. In the Harlow efficient Harlow's engine square delivers performance than has been accomplished by any of today's 80 m.p.h. rate, efficiency is evident in the reduced oil, economy and low maintenance, a single engine cruise speed of 160 m.p.h. at 2500 r.p.m.

Announcing the
HARLOW
Private Transport.

ALL METAL
Transport plane

Automobile COMFORT
As best a private airplane can be a cubic per foot

160 M.P.H. CRUISING
and 17 miles per gallon

17 MILES PER GALLON
and a reserve of 500 miles

\$8,585
Complete R-174 Aviator
PRICE DELIVERY TO COAST. VARIOUS NOTES

HARLOW AIRCRAFT COMPANY
Alhambra, Ariz., Alhambra, Cal., Alhambra, Cal.
Write for name and address of your nearest dealer

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Now you can buy a Stinson for

\$2995*



ere is the most sensational news in Aviation history! Stinson quality, Stinson reliability, Stinson ruggedness, Stinson beauty and Stinson prestige for \$2995.

The Stinson 105 breaks all aviation precedents. It is the plane YOU have been waiting for—the plane YOU can be proud to own, afford to buy and operate.

The 105 is every inch a Stinson from its beautiful nose to its streamlined tail. It is a big airplane with plenty of space for three persons and luggage.

You can GO places cross country in the 105. It cruises 105 miles an hour with better than automobile economy—twenty-five miles to the gallon. Fly 40,000 miles between major engine overhauls. The reliable 75 h.p. engine can be overhauled in a day. And economically, too!

Interiors are luxurious and set a new style trend. They are in good taste with rich wood finishes, soft fabrics and stainless steel adornments all blended in a harmony of pleasing colors. Visibility is excellent. Externally, stainless steel grilles, streamlined exhaust stacks, name plates, window moldings and cowl give it a distinctive appearance.

YOU will be proud to own a Stinson 105. Like its famous brother, the Reliant, used by airlines for pilot instrument training, the 105 is a beautiful airplane and spells engineering value throughout. It is an efficient, tractable airplane you will enjoy flying.

Features such as fixed slats and the latest type NACA flaps simplify landings. Non-grabbing hydraulic brakes and wide tread landing gear insure perfect ground control. These and many other features found only on planes costing thousands of dollars more, have made the new Stinson the talk of the industry.

The 105 is especially desirable for training purposes and charter work. Its ability to "take it" and to operate in high winds in and out of small fields—plus its outstanding beauty will attract new customers.

See this sensational new airplane. Write today for your free copy of Stinson Plane News which pictures and describes thoroughly the 105, the Plane YOU have been waiting for.

* F. A. F. Wayne, Michigan—lessening Federal taxes, not including State or local taxes. Low cost finance plan available.

STINSON AIRCRAFT DIVISION

Aviation Manufacturing Corp.

Wayne, Michigan, U. S. A.



STINSON 1939 "RELIANT"

See the new 1939 Reliant. It's just what the aviation industry needs now. High standards of performance for this plane among sportsmen, business, government agencies and air force and naval establishments also mean speed, sure conduct and more safety. The new Reliant has 20 new improvements.



OHIO SEAMLESS TUBING

Contributes to the Safety of Boeing 314's



Four of these 1800 lb. p. Wright Cyclone Engines Power Pan American's Ohio Boeing 314's

NOTHING but the best was good enough — safe enough — for Pan-American's new Boeing 314's. In the building of its four 1800 lb. p. Wright Double Row Cyclone 14 engines and in other vital places nothing less than "Ohio's" Special Quality Non-Oxidized Seamless would do. Pan-American, Boeing, Wright and, in fact, the entire aircraft industry know that "Ohio's" process of controlled atmosphere annealing and acidfinishing provides additional factors of safety through the elimination of the former oxidized surface.

Severe pickling with its consequent pitting action is eliminated; decarburization is definitely controlled; uniform grain structure and physicals are secured — all extremely important factors contributing to added confidence on the part of those vitally concerned in the increased safety of modern air transportation.

Aircraft parts manufacturers, engine and ship builders standardize on "Ohio's" Special Quality Non-Oxidized Seamless Tubing for strength, lightness and safety.

The **OHIO** SEAMLESS TUBE CO.
CHAMBERLAIN, OHIO
Shelby, OHIO

Ohio's Special Quality "Seamless" Tubing. Heat-treated tubing is essential to meet our exacting engine and aircraft airframe specifications.

AVIATION'S OPERATORS CORNER

TRACKING THE NEWS WITH

LEB NEVILLE



Cub Distributors Meet

Piper Compaq and Engine Makers Meet to Solve

DALE EUGLE MOUNTAIN seemed down-
hearted last month in a time expected,
even the day when her rules
were issued from the West Branch of the
Susquehanna River. It was the annual
convention of Piper Cub distributors
held March 14, 15, 16 over Look
Haven, Pa. Personal meetings took
place at the Palace Hotel, but these
were visits to the plant, flights from the
airport, and various other forms of ac-
commodation for the 30 distributors and
other guests.

Highlights of the meeting were the
announcement of price reductions on
new models. Among them were a new
30 hp. Standard Trainer, a 30 hp.
Cobra at \$49 less than the previous 16
hp. model, and a 65 hp. Cobra. Other
Trainer prices range from \$2395 for the
16 hp. Standard Trainer Standard
Trainer to \$1995 for the 30 hp. Lounge
and Light model. The Trainer as
new includes the Sport Models and
the additional "Sport" accessories are
extra. The Trainer 49 Cobra with
pumps, hydraulic brakes and landing
gear and other additional equipment
costs \$1835 and the 65 hp. Continental
Cobra costs \$1995.

Distributors' ratings in the order of
their sales were: Russell Air Service,
Birmingham, N. J.; E. W. Wright Air
Service, Inc., Providence, R. I.; S. H. S.
Cobra, New York; Art Winkler, Port-
land, Ore.; Delta Air Service, Min-
neapolis; Arnold, Astoria, Ore.;
Baird, Calif.; P. M. Morda, Waukegan,
Ill.; Evans Aircraft, Naperville, Ill.;
Tullis Aircraft, Ill.; Frontier, Ill.;
and Coast Corp. Flying Service, Wash-
ington, D. C.

Special announcements were made by
Delbert Clayton, Davenport, Iowa, who
had sold the most airplanes in proportion
to the population in his territory and
to Wm. Mendenhall of Waterbury,
Maine, who sold the second highest
number in proportion to population.
Olanick always of Birmingham, Pa.,
was also commended for taking aircraft
work at the end of his long year as
Cub distributor. One new distributor
was appointed, Leroy Howard of
Northwestern Flying Service of Charle-
ston, S. C.

On the program were lectures given
by Lyman and Franklin, a dinner by
Continental, musical parties by Con-
tinental, Lewis, Determan Frisco, and
the concluding Cub Dinner. Among

the speakers were Fred Barry and Je-
rome Leland, of Aero Industries Un-
derground, R. S. Hartman, Hatcher
Aircrafting Co., Longport, Calif., Ar-
thur, George Weisler, C.A.A.; Thomas
H. Bark of Chicago; and W. H. Pyle,
and Ted Ward.

College Pilots Log Hours

Pardon leads with over 500 and
17 solo students by March 11

FRANK SPADON is the latest participant
in the 25 colleges selected for the dis-
counters phase of the C.A.A. Graduate
Training Program. Led by Purdue,
which served as a model for the plan,
most of the schools got off to a good
start. By March 11 Purdue had logged
148 hours and turned out 17 solo pilots.
Others were also listed. An average
of 25 per cent of the student bodies
of the thirteen institutions applied. The
University of Alabama had 1824 ap-
plicants from which to pick its 30 stu-
dents.

After the student has passed a rapid
physical examination and conforming to
the qualifications of his college, the
C.A.A. he is ready to fly. It costs
him a maximum of about \$75 depend-
ing on the tuition rates of his particu-
lar school. Grad. breakdown is \$15
for physical examination and \$60 for
his insurance. The remainder is for
membership fee and tuition fee for the
required ground course. And if he is

among the late starters he will be de-
riving plenty of flying to log his 30 hours
by June.

Airline certification was expressed
by successful leaders for the train-
ing students. A project was proposed
by the Student Pilots of America, at
20 and 25 hours who were among more
than a dozen leaders, most of whom
were disappointed because of the dis-
cussion. Their credentials from the
school. At Lawrence (Kan.) Airport,
Aircraft Flying Service contacted the
contract awarded Robinson Aircraft
Corp. on the basis that the Center had
exclusive operating rights on the field.

Fixed time operations to which stu-
dents have been assigned are: L. I.
Army, 30 students at \$150 each on
Cubs (Purdue), Army Air Service
and Michigan Agricultural College
jointly, 20 students at \$150 each on
Aerovons (University of Michigan);
Rendell Aviation, 20 students at \$150
each on Aerovons (N. T. University);
R. W. Wright, 20 students at \$150
each on Cubs (M.I.T.); Sem-Air, 30
students at \$150 each on Cubs and
Kearney (North Carolina State Col-
lege); Eastern Air College, 30 students
at \$100 each on Cubs and Aerovons
(Georgia Tech); Alabama Institute of
Aeronautics, students at \$150 each
on Cubs (University of Alabama);
Boeing Flying Service, 30 students at
\$100 each on Cubs and Pests (North
Texas Agricultural College); Missouri
Aircraft, Inc., 20 students at \$150 each



Neel: This Cub brought realism to the Piper Distributors' Convention



With the onset of the "Razzle Dazzle" flight in its schedule this month, Chicago and Southern often share round trips daily between the Great Lakes and the Gulf.

C & S, then the "Valley View Route" from Chicago to New Orleans, and connects with every transcontinental airline.

Schedules are carefully designed to offset the traveling public's quick access to every important city in the Mid-West and South.

Chicago and Southern has made over 10,000 scheduled flight landings in the last 2 years with no delays caused by fuel pumps. That's dependability!

• Pertinent to its outstanding record for flying "on schedule," Bruce E. Brown, Vice President of Chicago and Southern, in charge of operations, states: "Chicago and Southern pays tribute to the superior performance and efficiency engineered into PESCO fuel pumps—standard equipment on all our transports."



PUMP ENGINEERING SERVICE CORPORATION
Specialists to the Aviation Industry
12910 TAFT AVENUE • CLEVELAND, OHIO, U.S.A.



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Measures for Defense

(Continued from page 27)

it has no intention whatever of interfering with the present mobilization. As far as it is possible the Corps hopes to avoid loading up with great numbers of airplane types which might soon become obsolete. Since a considerable long-range bomber is subject to obsolescence due to advances in military aircraft, we can expect a considerable emphasis in that direction.

More men, more money

The regular officer strength of the Army Air Corps is now 7,638, its regular enlisted strength is something around 15,000. For the new expanded strength it is estimated the Air Corps will need some 6,500 officers and 40,000 men. The program which the Army will use to close that gap have been the source of misunderstanding.

Chief confusion is caused by the Civil Aeronautics Authority for which the President appropriated \$10,000,000 per year in his January message. From a defense standpoint, that program is simply to develop a pool of civilians from which the Army and Navy might draw partly trained material in case of war. An American renders honor, it will be carried out by CAA. A division at civilian flying schools using civilian instructors. The students enrolling will be under no direct military obligation whatever. It's got to be said, at 30,000 graduates each school year, most graduates to have served from 30 to 30 hours of training. It is already open to say on a trial basis at some 12 colleges, wing leaders supplied from the Federal Youth Administration. Incidentally, funds for the first year (1952-1953) of full operations throughout the country are now specified in divided House and Senate bills at \$2,000,000 each at the original Senate of \$1,000,000.

Completely separate from this is an Army plan to use some of the larger commercial flying schools to give flying cadets the first three months of private flying training now normally given at the Air Corps Training Center at Randolph Field, Texas. The students will be full-fledged cadets flying on a 100 per cent military basis. They will be obligated to continue their training upon completion of the course, not as if they were at the

Training Center. Considerable distinction will be given by military personnel and civilian instructors engaged in this work will first have received an indoctrination course in army instruction methods at Randolph. After such a course the students who survive indoctrination will proceed to Texas where they will be given a four-month course at Randolph, plus a three-month advanced course at Kelly Field. Under this arrangement, Randolph will be relieved of some of the time-consuming primary work, is now given and is able to devote all of its efforts to basic training. Fortunately Kelly Field already has a large capacity than the previous flow of students has required. A set of new buildings is nearing completion, the old ones (which were to be torn down) are still standing and will be left in that condition.

Expansion Bill

The Air Corps Expansion Bill mentioned above provides for a total of 1,200 Regular Army officers and 3,000 Reserve officers on active duty. Actually the Corps plans to have a total of 4,000 Regular and Reserve officers on active duty within two years. The Regular officer strength is to be stepped up from its current 7,638 to its ultimate of 12,638 over a ten-year period to avoid creating a hump in the Army's promotion list.

The office of new related personnel will also pose a training problem of about wartime dimension. All ground-related mechanics are trained at the Air Corps Technical School at Chanute Field, IL, and at its branch at Lowry Field, Colo. Plans are un-

derway to speed up instruction process at these bases, but it may well be necessary to draw on the facilities of commercial mechanic schools throughout the country in help in the production of the new men.

The Air Corps has problems in simplified by the fact that the Wilson bill of 1952 already gives it all the industrialization it needs to construct additional bases. Also, the WPA and other governmental programs of work relief have already enabled the Corps to increase its budget and fill positions throughout the country to a large extent. Actually the \$350,000,000 estimate of the Air Corps increase provided for the beginning of next year is not likely of first three years to be in the United States, one in Puerto Rico, one in Alaska, and one in the Panama Canal Zone.

So much for the Air Corps. The Naval side of the program, if not spectacular, is no less worthy of study.

The Navy's plans

Unlike the Army, the Navy already possessed all the authorization it needed for expansion at its last Session last year for the revised National Defense Act, otherwise H.R. 9558, authorized the following program: The President of the United States is hereby authorized to acquire or accept additional naval vessels, including patrol planes and spare parts and equipment, so as to bring the number of ships and aircraft to a level of no less than those provided in the Act.

Now, get that "not less than." The 1952 program called for some 2,000 modern planes for our naval air by July 1, 1953. This does not mean outside's estimate unit on current strength of about 3,000. The next intervention of the National Defense Act means the Navy has to be ready by the time the new vessels for the fleet are ready. The vessel cost estimate for that building up is set at \$15,000,000. Actually last year's



Many battleships will remain in the fleet. Above: An American KDF-1.

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naval appropriation bill allowed \$37,251,000 for the equipment of plans for the naval air service—hardly a considerable sum. But this year Navy department will ask for \$124,647,047 at hearings about to open in Washington, on the 1940 Naval Appropriation bill. And in addition to this, remember the President has asked Congress to appropriate \$25,000,000 more for new plans should give the Navy a good head start.

The Navy is even better off in place as to types than the Army. But the Army, following the device already have shown up an intense Navy interest in increasing its quota of big multi-engine patrol planes. Each line for some substantial orders in the near future for these big seaplane craft.

With far smaller numbers involved in its expansion plans for the near future, the Naval Air Force faces a much less serious training problem than does the Air Corps. Sure that it may benefit in a general way from being able to draw directly-trained material from production of the C.A.A. program, the Navy has no plan for changing its standard Pensacola training routine in any way. With some exceptions, that routine should be adequate to handle all the duties required. More serious is the problem of obtaining a high quality of maintenance in the line of the Army Air Corps. The enlisted classes for a Regular Army commission. So far, Naval Flying Cadets who are not graduates of the U.S. Air Corps have no other status save that of Reserve officers on active or inactive duty. The fundamental objection of making Regular naval officers out of them is that they have not been trained for any other naval duty, and, as they reach advanced ranks, must therefore command vessels, or executive positions. Whether the solution will be some type of flying corps within the Navy, along the lines of the Marine establishment, or, perhaps, perhaps after the British Royal Air Force Commission system, remains to be seen. But Admiral Arthur B. Cook, Chief of the Bureau of Aeronautics, recently told a congressional committee that the navy is giving serious consideration to the problem.

If the Navy could act authoritatively to build new planes, it did have the opportunity for getting Congressional permission to enlarge its base facilities. As has been widely reported in the press, the House of Representatives has approved the bill which has been introduced by the late majority of a prop-

not to improve harbor facilities at Guam. As we go to press, the Senate seems prepared to do likewise. In addition to that, the proposed new base at Kasaan Bay (Hawaii), Midway Island, Wake Island, Johnston Island and Palmyra Island in the mid-Pacific area, Kailash and Sika in Alaska, and San Juan in Puerto Rico. Also included were enlargements of the training facilities at Pensacola, in the Fleet Air Base at Pearl Harbor, in the Naval Aircraft Factory at Philadelphia, and in the Naval Air Station at Hampton Roads, Virginia. Several of these bases are, on the surface, superbly equipped. Army base facilities. In this regard Admiral Cook has stated, "There is no assurance that these ships will remain

at these bases during wartime, but will go wherever the fast gun or anti-aircraft services. If the fact is in the Atlantic, the majority will go there; if the Fleet is in the Western Pacific, they will go there; if the Fleet is up in the Aleutians, they will go there; or they may naval aviation and based at any particular point can be considered as a part of the fleet force of that area."

This, like any other authoritative bill, has so far resulted in no actual appropriation of funds. In hearings before Congressional committees considering it, however, the cost during the next three years for these facilities is estimated at \$35,000,000. Presumably it will be forthcoming in naval appropriations after winter has passed.

Developing the ERCO Airplane

(Continued from page 47)

power at enough different points along the take-off path to cover the entire possible range. In some cases he had to make fairly sharp down-ward turns and land with the wind on either or get back in the field, and in making these turns it was apparent to him that the airplane was when flying at an entirely different attitude than that which he would have maintained had he had the conventional three controls. The two-control airplane was flying correctly with respect to the air, but he gradually lost the air and had to fly on the basis of his view of objects on the ground and his "guess-timate" of the wind velocity. He had originally intended to report the trials with all three controls as not too successful, but he changed his mind and confessed that part of the program on the basis that he was over to stop and thereby lose altitude as that he could not complete his turn from the same height.

While we are on the subject of the effect of high winds, it is probably worth while mentioning that during the year and a half that the experimental model has been flying, no wind has been encountered that has hindered handling on the ground, taking off, or landing. The plane has operated in high back-slashy cases, in case the Weather Bureau reporting goes up to 36 M.P.H. It has been faced with gusts in every direction in the strongest winds that it has happened to be operating in, and has never encountered any difficulties or required any outside assistance

As in the case of cleaning, freedom from rolling difficulties, the problem of obtaining satisfactory two control operation is more complex with a tractor airplane than with a pusher. The W-1 had two sets of fins and rudders, one on each beam, and being outside of the propeller stream, there was no noticeable difference in directional trim with variation of power. In the case of the conventional airplane, however, the twisting slipstream passing the beams and the rudders, and the change in the direction of the rudders to change as the power is increased. With a right hand propeller the vertical stream, which are ordinarily about the center of the airplane, move in effect an increasing mass from the left, and the rudder must be deflected toward the right to compensate for the effect, and maintain the plane on a straight course.

In two-control operation it is desirable that the directional trim remains unchanged, and the entire couple of controls and rudders settings. This condition is obtained without added mechanism in the floor tractor design by providing two sets of control surfaces and placing them at the ends of the horizontal section as in the case of the W-1.

Our flight trials and experience to date indicate that the new design plane has a maximum number of things for the pilot to control or to think of, and this is at first from all traditional characteristics, such as loss of control due to stalling, spinning, rising over, and ground looping.



Mr. Charles Feltner, President—Chicago and Southern Air Lines, Inc. with Mr. Howard

Airline Executives and Pilots like the Howard

Airline Executives like the Howard because its extra speed and higher USEFUL capacity permits them to make "off line" visits in the interest of Traffic, and for other purposes, in less time and with more load.

Airline Pilots, left free to choose, will usually select the Howard for practice in "instrument" flying and similar uses because it "arrows" through tough going and has exceptional stability at slow speed with power off for "blind" approaches and landings. They also like its "get up and go" performance.

The Howard is now designed so that it can be easily converted for many special uses without excessive cost. If you have a "flying problem" for an airplane in the 4-5 place category which has speeds up to 200 M.P.H. and useful capacity up to 1700 pounds, consult us, as the 1939 Howard may be the answer.



HELICOPTER?



Cross a well done man comes to present vertical flight. But it's an old story to the birds. Follow a black-chinned hummingbird. He can move up and vertically and lower in altitude. But he can actually fly backwards. To attain this unusual performance some designers have an unusual "joint plan" that turns up in an wing beat a minute.

Flight, whether bird or man-made, vertical or horizontal is inseparably linked to power. Through

steady engine means of fuel and engine power has conquered the "impossibility" of verticality. It is logical to assume that these advances will continue... and they must continue to come from improvements in both and engine.

That engine systems will always have fuel available that permit further progress. Fuel systems are daily being in practical research... to help provide tomorrow's fuel for tomorrow's planes.

ETHYL GASOLINE CORPORATION, manufacturers of anti-knock fluids containing tetraethyl lead

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Stacks and Rings

(Continued from page 35)

bon 2 outlets, one on either side of the sphere. One outlet located 5 cylinders and the other outlet the remaining 4 cylinders. By reference to Table 1 the maximum size tube of sufficient area can be selected for each section of the collector. For the exhaust elbow from each cylinder, 2-1/2" tube; main collector of 1st cylinder, 2-1/2" tube; at 2nd cylinder, 3-1/2" tube; at 3rd cylinder, 4-1/2" tube; at 4th cylinder, 5" tube; at 5th cylinder, 5" tube.

In the collector shown in Fig. 1 the main collector at the 4th and 5th cylinders is fabricated from sheet material to approximately a tubular shape. It may seem this last section of a collector ring is elliptical in shape to reduce resistance when a protrusion follows the ring itself. The elliptical shape is also necessary at times to obtain clearance with the adjoining engine or cowl.

It should be noted that there is no increase in size of the main collector when the 5th cylinder is picked up. A careful examination of Fig. 1 will show that the last exhaust elbow joins the main collector just above the outlet. Inside at the cross-sectional view of the main collector is constructed this last elbow is provided an independent short exhaust pipe joining it to the main collector and serves a useful structural purpose however. All but the last section of the collector ring are doubly supported—at the exhaust ports and at the point of joints with the adjoining sections of the collector. By attaching two elbows to the last section of the collector ring it can be adequately supported without the use of an auxiliary brace. The method of supporting the last section also leaves the disadvantage of not allowing for expansion. This problem will be discussed in detail under the sub-heading "Structural Considerations".

When exhaust collectors connect to manifold tubes or other restrictions to free flow of the exhaust gases it is necessary to increase the cross-sectional area even more than the amount taken up by the restriction tube or restriction. To maintain a low back pressure it is recommended that a factor of 3:1's square inches per horsepower be used in this case at places of 60.

When long tail pipes are used it is advisable to increase the cross-sectional area of these pipes by 15% to prevent a build-up of back pressure.

Shape and Location

The shape of an exhaust collector is determined by the location of the engine exhaust ports and the best location for the collector outlet. In general, short elbows carry the gases from the exhaust ports to the main collector ring at close to the engine as comprising photographs. The main collector ring may have either 1 or 2 outlets. The location of the exhaust outlet should be determined after consideration of the following points:

1. Five based—The exhaust gases must not impinge directly on any portion of the airplane structure within 4 feet of the outlet. To meet this condition the exhaust collector is usually extended from 2 to 5 inches beyond the cowling line. It is also dangerous to run any portion of an exhaust collector under fuselage tanks or drum.

2. Carbon monoxide—The exhaust gases, which contain large quantities

of carbon monoxide, must not pass near the cockpit at cabin or any openings in the fuselage that lead to the cockpit. The presence of more than 0.1% of carbon monoxide in the air is sufficient to cause headache. The method of measuring the carbon monoxide content of cockpit or cabin is described later under the sub-heading "Measurements".

It is common practice to make use of the propeller slipstream to carry the exhaust gases clear of the cockpit.

In the single outlet type of collector shown in Fig. 3 the outlet is located on the right side of the airplane where the propeller slipstream will carry it down and under the airplane as far from the cockpit as possible. In the two outlet type collector shown in Fig. 1 the outlets are located below the airplane. The rotation of the slipstream will carry the exhaust from these bottom outlets about 15 inches up on the left side of the fuselage. This is not usually evident unless there are openings such as gun chutes, screens for retractable landing gear, or other openings in the region that are close or too inter-connected with the cockpit. If such openings exist excess pressure of carbon monoxide will be trapped in the cockpit. The connections between these openings and the cockpit must be completely sealed to prevent (Turn to page 80)

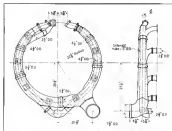


Fig. 2 Exhaust manifold for White Gopher 3000 cc. 4-cyl. Side elevation shows inlet tube built-in with every level located behind engine reference. This shows a supply of dry air under all operating conditions. Also show the single exhaust outlet in the lower right corner.

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Stacks and Rings

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the collection of carbon monoxide. The location of the carbon monoxide into the cockpit can be readily determined by using the Carbon Monoxide Indicator described later under Measurements.

In open cockpit planes or the convertible type employing a sliding hood the velocity of the air just at the place used for the exit of the exhaust. The suction on the cockpit then draws air from the remainder of the fuselage which in turn racks air in through any openings in the skin. If any of the openings are in the exhaust flow, carbon monoxide will be sucked into the cockpit. One remedy for this trouble is to install just an opening in clean primary air flow coming from the engine exhaust gas opening. The engine needs will then be satisfied by the pure air opening and no carbon will occur at the engine opening. Another effective method is the installation of a gas tight hooded, either metal or cloth, between the cockpit and the fuselage opening.

3. Window—The exhaust outlet must be so located that the fuselage disturbance at right will not interfere with the pilot's vision and will not be visible to passengers. After dark the exhaust flame is quite visible and would frighten passengers. The place for the flame gas should be obviously so that a pilot's vision. On single engine planes exhaust outlets located on the lower right side, or the bottom of the plane are satisfactory. On multi-engine airplanes the exhaust outlets should be located on the outboard side of the engine nacelles or in such position they are hidden from the cabin by the wing. In a low wing transport it is a relatively easy matter to exhaust just below the wing.

4. Yaw—Exhaust outlets should be located to maintain the yaw reaching the cabin. In general the best location in the yaw will be the same as for Yaw. The extension of the collector to place the outlet at the rear will reduce the yaw considerably but the increase in weight due to the long extension is seldom justified.

The choice between a single or double outlet for the exhaust outlet depends upon several things. The advantage of the single outlet as shown in Fig. 1 is that it can be

located in a spot that will avoid car box, monoxide trouble, or exhaust flame. The disadvantage is the large size of a single outlet. If a tail pipe is required to carry the gas, this pipe must be very large and heavy and will not poorly because of the reduced rate of exhaust cooling rates in internal volume in the fuselage increases. These arguments apply usually to the larger engines developing 1800 horsepower or more. The single outlet and tail pipe works out very nicely for the 400 horsepower installations shown in Fig. 2. In this case the tail pipe is well exposed to the atmosphere which means adequate cooling. It also serves a useful purpose in heating the cabin air.

The two outlet type collectors shown in Figs. 1 and 2 are somewhat easier to maintain and are small enough to fit conveniently in the space normally available. They also have the advantage of having an open space at the bottom of the fuselage which is an excellent position for mounting an oil cooler. The big disadvantage of the two outlet exhaust is the wide area covered by the pipes as they are swept rearward by the airstream. In the larger engine installations that makes the installation of carbon monoxide from the cockpit very difficult.

To maintain back pressure the flow path of the exhaust gases must be kept as smooth as possible. All bends in the exhaust down or collector should have a radius of curvature of 3 times the diameter of the section. The collector should be designed so that constant flow exists at all points of maximum. The exhaust tubes from the cylinder ports should be curved so as to enter the main gas as early as possible. The intersection of the elbow centerline and that of the main collector ring should form an angle of less than 30 degrees. The fillet at the axial intersection of these tubes should have at least a 4 inch radius. With the proper radius in laying out a smooth collector shape and the elimination of restrictions or roughness within the collector it is possible to keep the back pressure very low. It is a frequently impossible however to design a collector in these optimum conditions. If the design is such that the back pressure is excessive at one or more points it is possible to reduce the pressure by directing a jet of cooling air at the offending spot. By reducing the temperature of the collector skin the pressure is thus reduced. Cooling the inner collector is also beneficial in the same way.

Rocket collectors for in-line engines are designed on the same principles as radial engine collectors. The main collector pipe is fairly straight and extends from the front to the rear of the engine where it discharges in "X" type engine installations an independent collector is run on each side of the engine. The location of the exhaust outlets must be carefully selected to protect the cockpit from carbon monoxide fumes.

Down Patrol

(Continued from page 18)

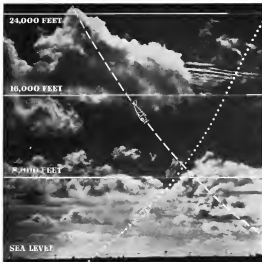
the school has been known as "The House of the Down Patrol".

The Down Patrol gradually became a more formal organization until today it is at the control of all Sports students which holds regular meetings, gives its own officers, conducts link business and social projects, and acts as official representatives of the students to the school officers. Each student in enrollment receives a letter pin in the shape of wings with Sports letter "D", and an enrollment is received a card of life membership in "The Down Patrol".

Of course the personnel is constantly changing with the enrollment and graduation, but a program of sports, drama and contests keeps the organization active. Competition within the group is keen, and every month or so, spot landing contests are held. Advanced students are handicapped, and a small entrance fee is collected to help a prize for the winner. Participation in various events has won the Down Patrol many prizes and trophies. Several outstanding cases of Texas and other cities, who have proved themselves good friends of "The Down Patrol" have been named honorary members and awarded honorary pins and cards.

Though the list of the cross-country flights is large in the modern-made-the language, drama, sports and entertainment—all are the primary purpose in cross-country flying experienced for student pilots and enthusiasts. The Sports School has found these cross-country flights in a group or be desirable to attract students from every quadrant of the planet. The project begins with thorough inspection and making up of the planes. Canoes must be good and involving many trials, use of weather

(Over in page 19)



At ALL altitudes, at ALL throttle positions



Repeated flight and laboratory tests positively prove that the new Bendix-Stromberg Injection Carburetor accurately maintains the predetermined best mixture ratio, by fixed new metering jets. Because of this, lean and eco-

nomical settings may be safely used. Engine operation is smooth and the pilot need never fear as the engine "takes the gas."

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INJECTION CARBURETOR**



Proven
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SUPREMACY is a pleasure in handling a Chief '50' — students are confident pilots — from first flights to soloing — because they know the Chief '50' is the only airplane in the world that is so easy to fly as a Chief '50' — it is built to fly — it is built to fly — it is built to fly.

**NO WONDER THE
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**AERONCA
HOLDS 23
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Record after record has been appended to the list of records of Aeronca airplanes — a reflection of the quality, reliability and economy of the Chief '50' — a reflection of the quality, reliability and economy of the Chief '50' — a reflection of the quality, reliability and economy of the Chief '50'.



All over the country instructors and students are turning to the Chief '50' for their training purposes. Why? It's a low-priced, smartly streamlined plane with outstanding performance qualities and engineered features that are attracting world-wide attention — the real value leader. Comfortable ride by side seating with dual wheel controls is ideal for convenient instruction of students — and the flying ease, speed, stamina, safety, and economy of operation make it the "Champion" it has proven to be.

Now is the time to "check up" on these statements. See your Aeronca dealer — he will be glad to give you a free flight demonstration. — You then can easily see why the Chief '50' is establishing new sales records, too! Send for dealer's name and descriptive literature today.

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months. Plus
\$10.00 per
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Grooming Canada's Aircraft Industry

(Continued from page 77)

operated at \$1,250,000, in which the company stock is 51 per cent owned by the company itself; manufacturers a small amount of private stock, is owned by interests not directly associated with the aircraft industry, and all shareholders are British subjects with companies companies being either British Empire controlled.

To take care of this control order for licensing plans and subsequent orders by the air component companies, these and other companies are developing considerable plant resources. In the past two years plant extensions have been about among Canadian aircraft manufacturers. This year will see more extensions. Starts the number of employees is growing. Most Canadian companies reporting on a survey made for this article show that before the end of this year they expect from 50 per cent to 100 per cent increase in their personnel. Most of the young men working in Canada's airplane plants came from technical schools and the few aviation schools opened in the Dominion.

Individually the Canadian companies line up show that De Havilland Aircraft of Canada, Ltd., has a plant at Toronto, to which recently has been added 20,000 sq ft in a cost of \$180,000. They 140 men at work during the winter and early spring months the company was producing one Tiger Moth Trainer a day in a 200 machine order for the parent factory in England. The plants were equipped with one engine. The company has been in Canada for 12 years, has built some 100 planes for private hire, making ships for the Royal Canadian Air Force, naval ships for the Royal Canadian Mounted Police, and for commercial Canadian transportation. The

company holds and distributes De Havilland aircraft and engine engines.

National Steel Car Corporation with head-office at Brampton, Ontario, built a new plant on a 33 acre site at Toronto in 1954 at a reported cost of \$400,000. The plant is some distance from the central line station, and has accordingly built a new major transport line which can be used with powerful pumps for fire fighting. The plant employs 340 men and is working under license as an order of 25 Westland Lynx fighter fighters for the Canadian government, on which production is to start in May, in addition to its share of the parts manufacturing on the Boeing Type Hercules bombers.

Forthright Aircraft Ltd., Longwood, Que., is building an extension to its plant with its own airport and airplane line this summer. With 300 men employed during the winter and early spring, to be doubled later this year, the company was working under license on a number of modified English Bristol Blenheim aircraft for the Canadian government. The company represents Lockheed Aircraft Corporation in Canada in sole selling agents for all products, and has manufacturing rights for the Lockheed Stearman.

Canadian Car & Foundry Co., Ltd., Montreal, have leased a plant at La

cluse, Quebec, for the parts manufacturing of Boeing Type Hercules bombers on the British Air Ministry order. The company also has a plant at Fort William, Ontario, where Grumman fighters are produced. At Fort William it is a specially underfoot project plane and being built for the British Air Ministry. The company also arranging for a license factory in Mexico in a cooperative set up with the Mexican government.

Canadian Vickers, Ltd., oldest of Canada's post-war aircraft manufacturers, has ample space to take care of its military orders, and plans to increase its personnel from the present 400 to 600 before the end of 1955. In its 100,000 sq ft. plant at Montreal, Vickers have been building flying boats and land planes for the Canadian government since 1952. In addition to orders from the general assembly organization, Vickers is building under license 20 Northrop Delta and 10 Supermarine Seaquester flying boats (largest ever built in Canada) for the Canadian government. With the completion of this order Vickers will have built 300 aircraft of different types (Vickers, Fairchild, Potters and Bellanca) since its inception.

Norwegian Aviation Ltd., has been manufacturing its own high wing monoplane Norwegian designed for northern Canadian flying conditions and developed since 1950 at Carletonville airport, Montreal. To take care of expansion it has leased this year a factory at 72,000 sq ft at Longue Pointe, near of Montreal, and will



Norwegians new plant at Longue Pointe, Montreal



National Steel Car Corporation plant at Melroe Airport, Toronto where De Havilland Lynx fighters are being built

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move from its Carterville plant. It has no military orders at present through the Royal Canadian Air Force has bought most of its Mustangs for training purposes. State Aircraft holds a manufacturing license for North American X-518 advanced trainers, 400 of which have been ordered by the British Air Ministry in the United States; it expects to receive orders for these ships from the Canadian government.

Ottawa Car Manufacturing: General Limited holds license for Armstrong Siddeley Motors, Armstrong Whitworth Aircraft and A. V. Roe & Co. Its no. 275,000 sq ft factory at Ottawa it has already started making parts for the Handley Page Hampden bombers. Attention to the plant being made at a cost of \$175,000. Data on production is not available, but personnel will be increased during the year from 136 employed during the winter months to 215.

Prest Aircraft of Canada Limited is making additions to its plant at Port Kaituma, Ont., to take care of military orders from the central assembly set-up. It is also building training ships for the Royal Canadian Air Force. Orders last year were reported to total 158 planes at a value of \$550,000. The plant has developed a reputation for Canadian confidence. Much of the production is for export, for companies having equipped in Canada to Central and South American countries as well as to China.

Reo Aircraft of Canada is working on 17 Blackburn Swift bombing planes for the Canadian government, employing those 200 men. The plant on the west coast is expected to receive some British military orders in addition to any handled through Canadian Associated Aircraft, at which location is not a matter.

Rob Aircraft Ltd., plus numerous other plants in the Ont. where they are producing light planes for private flying. No reports of military orders are available from this plant since the company was incorporated at the moment with the British Air Ministry last year.

In addition to these aircraft manufacturing plants in Canada there are a number of accessory manufacturers and assembly plants for landing gear, skin and bolts, for engine assembly and servicing. Auto engines are not manufactured in Canada. Aircraft Union States engine represented by Canadian branch companies are Pratt and Whitney, and Wright.

Canada's airplane industry has not made the mistake that the airplane industry has in the United States be-

cause it is cheaper to import planes from the United States. What one plant not operating in Canada have had a hard sell. But, only the possibilities of military orders has brought big business into the airplane industry in recent years. Continued operations with 212 planes in service at September 26, 1939, latest figure have bought most of their planes in Canada, have flown more across the international border from United States plants. The last year for which official figures are available, 1937, the Dominion Bureau of Statistics report 118 planes produced in Canada at a value of \$1,811,035, whereas Canada imported the same year airplanes valued at \$1,468,621 without engines, and engines and complete parts valued at \$7,022,594.

While the first place flown in the British Empire was piloted by J. A. D. McCurdy at Fairbairn, Nova Scotia on February 23, 1909, no more airplanes than those contracted by Dr. Graham Bell's young men were built in Canada till the reversion of the World War brought McCurdy to Toronto to build a factory to turn out planes for the British government in 1916. This was recorded later in 1916 by Canadian Aeronautics Ltd., the original Macdonald-Bell's own airplane manufacturing plant at Toronto. In twenty months this plant turned out 2300 154 and Avro two seater planes to order for thirty F-11 Flying boats. Engines for all these planes came from England.

From the end of the World War till 1933 there was little done except servicing on Canadian war time airplanes. This year Canadian Vickers received its first government order for eight single-engine amphibians for the Royal Canadian Air Force. There came a search for a Canadian airplane company to supply it. To Canada's late model, warlike, resulting in Vickers three plane Vulture flying boat. By 1937 a number of other companies had started up, but Vickers still built practically all of the Canadian airplanes, and that year started on Fairchild's De Havilland established a branch plant in Canada at Toronto that year, and Wright engines were then assembled and serviced from a plant at Montreal. In 1939 at the head of the pre-depression aviation boom, Canadian Consolidated, Baltimore and Boeing entered the Canadian field, while Vickers received a P-40 fighter manufacturing license. Canada's Empire travel product, the Empire State, is now at the head of other aircraft industries in the Dominion primarily for export purposes.

With the 1939 crash and the drop in aviation interest, followed by a government economy campaign in the air mail and Royal Canadian Air Force developments, aircraft manufacturing came practically to a standstill in Canada. Only in the past three years has the industry taken a new lease on life, as the government decides to start overhauling decisions.

Dawn Patrol

(Continued from page 87)

volunteers, working out attention problems, and the lessons of early morning flights in case of emergency landings. Arrangements must be made for refueling in accordance with the crossing speed and fuel consumption of the various planes. Post-flight radio equipped aircraft must study headings, and before and after the crossing of various radio stations along the route. They must be familiar with all radio and airport rules, and must know how to use their planes when away from the home base. No small feat in the aerial probing of airplanes in formation.

One example of the important part this cross-country flying of the Dawn Patrol plays in the flight education at the Sperry School may be given from a summary of such flying during the past three years. In 1936 the Dawn Patrol made 25 cross-country flights, involving 25,000 miles. The largest party was that given in a group of twelve planes which visited the Centennial Celebration at Dallas, Texas. During the year 26 different men and women were directed during cross-country flights to visit at seven different cities. In 1937 45 cross-country flights were made covering 40,000 miles, most notable being an Overland Ohio to attend the National Air Show with stops at St. Louis, Terre Haute, Indianapolis, Chicago, Cleveland and Springfield. In 1938 25 cross-country flights had been made up to June 30th, totaling 10,000 hours of flying and covering 12,000 miles. Longest trip was to Chicago to attend the International Aircraft Show in February and the longest formation was a flight of 16 planes to Peoria, Ill., Oklahoma on April 20 and May 1st. The longest one-way trip was previous to the student who is landing a career in aviation.



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Mr. C. E. Conner,
Superintendent of the Pacific Northwest Division,
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My dear Mr. Conner:

As you are about to go on an inspection trip, I am writing you to suggest that you consider inspecting the Waco Model S. This plane has been a great success story with the service of inspection and inspection divisions.

As you probably know, the Waco Model S is built in the United States and is a well known and reliable plane. It is built in the United States and is a well known and reliable plane. It is built in the United States and is a well known and reliable plane.

Should you be interested in the Waco Model S, please write to me and I will send you a copy of the literature and a list of the dealers in the United States.

Sincerely yours,

W. B. Berry

Waco Aircraft Company

1111 First Street

Seattle, Washington

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WACO MODEL N—Super—Bomber—comes in 4-5 place day or night 4-5 place airplane

Full Coverage Insurance
is available on new Wacos
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WACO MODEL C—Best selling performance—many models—American representative

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The numerous curved sections in the transparent enclosures on the Martin model 166 are fabricated from the outstanding acrylic plastic, Plexiglas.*

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RÖHM & HAAS CO., INC.

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AVIATION
April 1949
31



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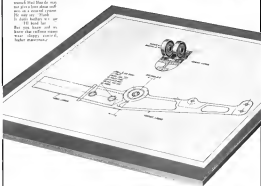
AVIATION
April 1937
31

A LITTLE ENGINEER
READS A STORY
PLOT



Stanley Marchant, chief pilot of the "Blue" search that they do not give a hint about and now, on a second system. He says: "Think it into building it in 10 feet for the one hour and we have the engine come away, slugs, correct, better maintenance."

The drawing board's the place to cure "CALCIFIED CONTROL COLUMNS!"



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April 1968
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Fig. 101
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A few of the styles available.



Fig. 102
7'x16"
Steel

Fig. 103 — "Hallowell" Bench with flanged steel legs and universal joints to meet Shop Equipment Bulletin No. 101.



Fig. 104
7'x16"
Steel

Fig. 105 — "Hallowell" Bench with flanged steel legs and universal joints to meet Shop Equipment Bulletin No. 101.

"Hallowell" Bench Work Benches are available for application to your various benches. The steel plate gives a wide base.



Above: A partial view of the new aviation school. Below: Measurement measurements of engine parts by Mechanics students.

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AVIATION
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Lieutenant Kenneth C. Hawkins, the President of Western Air College, was graduated from the U. S. Naval Academy at Annapolis in 1919 with a degree of Bachelor of Science. In 1928 he resigned from the Navy to pioneer the New York, Rio de Janeiro & Buenos Aires air line, later acquired by Pan-American, and was for several years operations manager of Pan-American Grace Line down the west coast of South America. Prior to his resignation, he headed the Naval Cadet school at San Diego. He personally selects the heads of the various departments and all flying instructors must meet his line requirements.

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LIEUT. KENNETH C. HAWKINS, President
Alhambra Airport, Alhambra, California

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Alhambra Airport, Alhambra, California
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April 1939
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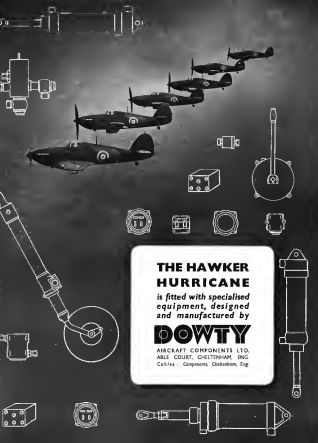
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